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COMMITTEE ON BRITISH FORESTRY.

MINUTES OF EVIDENCE

TAKEN BEFORE THE

DEPARTMENTAL COMMITTEE

APPOINTED BY THE

BOARD OF AGRICULTURE

TO INQUIRE INTO AND REPORT UPON

BRITISH FORESTRY

WITH

APPENDICES AND INDEX.

Presented to both Houses of Parliament by Command of His Majesty.

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MINUTES OF EVIDENCE

TAKEN BEFORE THE

DEPARTMENTAL COMMITTEE

ON

BRITISH FORESTRY,

AT ST. STEPHEN'S HOUSE, WESTMINSTER, S.W.

FIRST DAY.

Tuesday, 22nd April, 1902.

PRESENT:

Mr. MUNRO-FERGUSON, M.P. (*Chairman*).

Sir JOHN F. L. ROLLESTON, M.P.
Mr. EDWARD STAFFORD HOWARD, C.B.
Professor W. SCHLICH, C.I.E., F.R.S.
Colonel FREDERICK BAILEY, R.E.
Professor JOHN R. CAMPBELL, B.SC.
Mr. JOHN HERBERT LEWIS, M.P.
Mr. GEORGE MARSHALL.
Dr. WILLIAM SOMERVILLE.

Mr. REGINALD H. HOOKER, *Secretary*.

Mr. SAMUEL MARGERISON (English Timber Merchant, of Calverley, near Leeds) called; and Examined.

Mr. S. Margerison.

22 Apr. 1902.

1. (*Chairman.*) You are a representative of the English Timber Committee of the Timber Trades Federation of the United Kingdom, and are yourself a large timber merchant?—Yes, I am.

2. You are accompanied by Mr. Hopton, so that if any member of this Committee desires further information than you give, Mr. Hopton, who is Vice-President of the English Timber Trades Federation, will be glad to supplement it?—Yes.

3. In following your statement (*Appendix III.*) it is apparent that you regard foreign methods in forestry as producing, on the whole, better financial results than British methods in forestry?—I do.

4. You believe, nevertheless, that certain qualities of timber are found in greater perfection in Britain than in foreign countries?—Yes, in qualities useful for certain purposes.

5. Therefore, to supply certain limited requirements, you think it is better to grow trees singly or in a thin crop than in dense plantations?—Yes, for certain limited requirements, but for general financial results certainly the Continental method is better, particularly I think the German, from my own experience of what I have seen there.

6. Therefore, in the main you would advocate the growth of the greatest possible bulk of clean timber upon any given area?—I would.

7. And that not only as affording the best returns, but as supplying the chief wants of the market?—Yes, exactly.

8. The conditions to which you refer in your statement—that of being able to obtain clean, long, straight timber—are the conditions that are required for practically every purpose, from building timber to pit props?—Yes, exclusive of things where resistance to indentation is of greater importance, where durability on exposure to weather is concerned, and where the timber is required in short lengths and not in particularly long lengths. In the case of those kinds of timber, the trees grown under what I may call the present conditions general in this country, are more suitable—where short length, durability, weight, density, and toughness are required. But where long lengths, as you say, are required for building timbers, the Continental timbers are more suitable, and, of course, are more available where cheapness of production is of importance.

9. For building timber as well as for other purposes the highest quality is generally obtained in the foreign timber, which commands, therefore, more favour and a higher price?—Yes, because of its greater length of grain and freedom from cross grain owing to having been grown in longer annual lengths, as distinguished from larger annual girth. Foreign timber seems to be grown more with a long "cone upon cone" annual growth, and so there is longer space between the knots and there is less cross grain, and the timber generally is freer from rough knots and similar defects.

10. Without divulging any trade secrets, could you give any comparative prices as between home and foreign-grown building timber, pit props, or battens, having regard to your examples of cases where one timber commands a higher price than the other?—My business is especially amongst English timber, and very little amongst foreign; I have so little to do with foreign timber that I should scarcely feel my evidence on that point would be valuable to you. It is a point on which Mr. Hopton, our Vice-Chairman, could enlighten you, and I should be glad if he could give evidence on that matter.

11. We might ask that of him presently; but it is within your knowledge that for certain purposes foreign timber does command higher prices than English?—Yes. For my own private purposes when building I have had to pay higher prices for foreign timber than for English timber. For instance, red deal is very dear in comparison with Scotch fir, spruce, and the fir tribe generally. If we come to oak, one has to give higher prices for British oak than for foreign oak, but at the same time I consider it is of higher value.

Mr. S Margerison.

22 Apr. 1902.

12. You believe, nevertheless, that home-grown coniferous timber ought to be, for most purposes, as good as the foreign grown, providing that it has been as well managed?—I think so. I have had occasional lots of English-grown spruce and Scots pine as free from knots, as clean, and, in my opinion, quite equal to foreign spruce and pine.

13. Taking the British system of growing trees singly or in a thin crop, and obtaining, in consequence, the higher prices to which you refer, does not the loss to the landowner involved by the extra land occupied under that system amount to more than the extra price received for the wood?—I have not gone into that in detail so as to give a mathematical calculation with regard to it, but from my general experience I should say certainly, considerably more loss.

14. I may take it that you consider that all coniferous timber should be grown dense, and probably most kinds of hard wood also?—Yes, I should not be very positive about the larch; the spruce, the Scotch fir, and most of the pines and firs, I think should be grown densely in order to procure the best results, both in quality and in quantity.

15. I observe that you are in favour of working plans; do you think that they would be an advantage to the merchant and to the grower?—Yes.

16. A methodical arrangement of the timber areas?—Yes. I am sure of that.

17. This would probably secure a more regular supply of timber for the market?—Yes.

18. Would more regular fellings obtain easier terms for the transport from railway companies?—That is rather a difficult question to answer. Unfortunately, where there is no competition, railway companies are difficult to manage, but I think there is a feeling growing amongst some of the railway companies that regularity in the supply of large consignments would be one means of inducing them to give easier rates for carriage. Another point is that if there were regular supplies, especially in large quantities, in a certain district, there would be possibilities of converting, or partially converting, the timber on the ground, and forwarding it by the railway companies in that partially or wholly converted form, and we should stand a better chance of saying to the railway companies—I do not want to use a strong term, but nothing more applicable occurs to me at the moment—something with regard to the inequality of differential rates—I do not wish to use the term "preferential"—as accorded to foreign timber over English, because, as the railway companies say, imported timber is in a more handy form. They send deals, battens, and boards at a considerably lower rate than we can send round timber, and possibly if we had larger areas with regular consignments we might have a better means of sending our timber in the form of deals, battens, and boards, and consequently have more convenient consignments for the railway companies, and cheaper rates.

19. Do steam transport on roads or water carriage have any check on railway charges?—My experience of water carriage generally is that the railway companies have had such control of it that it costs almost as much—I am speaking now of English water carriage—as any other form of transport; there is very little difference between the railway company and the canal company now.

20. And what do you say as to steam haulage by traction-engine?—I have not tried it, but I am told that steam haulage on suitable roads is considerably cheaper than a combination of horse haulage and railway carriage.

21. How would you deal with the railway companies to secure those lower rates in any other way than by competitive forms of transport?—I do not know of anything better than competition, or alteration of the existing state of things by Act of Parliament. Round timber, even for intermediate stations, is carried at a very considerably higher rate of carriage than square timber from ports. I have some rather startling figures on that point. By Act of Parliament round timber is placed in a higher classification than square timber. If I may mention one or two instances now, I can give illustration of what I am saying. This is what one member of our Federation has reported to us, and we could give you hundreds of instances, but I think a few probably will show you the principle. From Hull to Birmingham, about 130 miles, imported deals 13s. 4d. per ton measurement weight. Derby, an intermediate station, to Birmingham, about 40 miles, English round timber 11s. 2d. per ton measurement weight. Gloucester to Birmingham, imported deals 6s. per ton measurement weight, that is 66 cubic feet to the ton. Gloucester to Birmingham, English round timber 11s. per ton, 40 or 50 cubic feet to the ton according to the species. We have hundreds of such cases, but that would perhaps just give you an idea of the principle.

22. It gives us a very good idea. With regard to provision for transport in the actual plantation, do you find that woods are, as a rule, conveniently laid out with roads or rides, or any other provisions, to enable the merchant or forester to extract his timber conveniently from the felling areas?—Yes; that is a most important matter in the haulage of timber, having good roads, well planned. It is as well to get an easy down gradient, if possible, to the exit, with as good a surface as can be afforded.

23. Is that what you usually find provided for you in English woods?—No.

24. Do you prefer to fell and lot your purchases, or to have it done for you?—Personally, I do not mind which way it is done; on the whole, perhaps, one prefers to fell.

25. Is the plant in British saw-mills up to foreign standards?—Those in the towns probably are, but that is a thing I have not had quite so much experience of as I think Mr. Hopton has. He has seen saw-mills and plantations not only in Germany, but in Austria and Hungary. In America the mills are in the woods, and they are in that particular more advanced than they are on the Continent. There are very large areas to cut out there, with water-floatage and other facilities, and there is no need to move about the appliances to the same extent as is done here or on the Continent.

26. Are most of the men connected with the timber industry or the timber trade very well qualified to value standing timber?—I think the responsible men are.

27. I will give you one or two practical examples that occur to me. Is it a matter of common knowledge amongst your men or amongst ordinary foresters or wood managers, how many cubic feet there would be in a given wooded area in the various stages of its growth, say, from 30 years to 120 years? Do you employ any men for valuing?—I do my own valuing.

28. Do you find that the men with whom you are brought in contact are usually able to tell what the weight of the wood is—how many cubic feet of wood there is upon the ground?—Usually, speaking in very general terms. Of course, there are instances where men do not know, but I find they are very rare, and they are increasingly rare, especially as we are gradually getting more and more Scotsmen into the places of the English foresters.

29. Is that because they are better educated?—I think they are better foresters.

30. Of course it needs training?—Yes; it needs training, and that is the point.

31. But you think that most of the men you come in contact with would be able to tell you how many cubic feet of marketable timber there were in a certain wood as it stood?—Yes, given time and opportunity. I do not mean that they could do it at a glance, but given proper opportunities I believe the responsible men could estimate it very nearly.

32. And knowing the quantity, do you think they could give a reliable opinion as to whether there was too much or too little at any time?—No, I do not think they could, speaking broadly. I think that again is one of the points on which education is required.

33. If a forester puts a value on a standing tree, do you think he usually knows what price per cubic foot he is getting for it?—My experience is that he usually does.

34. Would he know what the timber cost per ton or cube to move to the railway station, to the wharf, or to the consumer?—In my experience, yes, generally.

35. And what it would cost per cube to haul it to the saw-mill, or cut it into the usual scantlings or boardings for estate purposes or for the market?—On conversion he may require some education and experience, more than he has, generally speaking.

36. Do you think it to be the case that most owners and agents, and occasionally some foresters and buyers, are deficient in knowledge regarding the management of their work?—They seem to know more of the selling part of the business than they do of the management

of the woods—they seem to know that part of the business better than they know the management. They do not know about rearing and getting the best crops. I am speaking broadly, and, of course, there are brilliant exceptions.

37. Have you any views as to what kind of training is most required for foresters or those who have to deal with the utilisation of forest products?—One of the first essentials is, I think, that it should be easily obtainable, because a forester under present rates of remuneration could not afford three years at a university in order to learn the whole of the necessary details of his education. I think that is one important point, that the education should not be at one particular centre only, but should be distributed, perhaps by the present machinery (the local colleges through the country), so that local men might attend, say, evening classes with reasonable ease, much in the same way as the agricultural and other classes are conducted at such places as the Yorkshire College.

38. Do you think that adequate precautions are taken by private owners and by the State against wind and fire, either by maintaining shelter belts, or insisting on proper safeguards being used in the construction of locomotives?—In my experience I have not come across any serious accidents from those causes, and so I am not prepared to answer that question as it should be answered.

39. Do you believe that the United Kingdom might be made self-supporting in the matter of timber?—In the larger quantity of timber that we require I believe it could.

40. (*Mr. Stafford Howard.*) Does that apply to both hard wood and soft, such as pine?—More particularly to pines; but, of course, there are many kinds of hard wood that could not possibly be grown in this country because of the climate. But I believe we could grow the larger quantity of the woods mostly used, including ash, of which there is a great scarcity, and it would be a most valuable timber to plant at present under suitable conditions. Then there is oak, which, of course, would take a longer time to realise. I honestly believe that British oak is better than any other oak.

41. You could not do that without extending the area?—No, we could not, but there is plenty of available land at present which, if it could be by any means planted, would hold immense crops of timber. The crop on the present wooded area could be vastly improved.

42. Do you think there is a great quantity of land which is not now planted where it would pay to plant oak?—I think so. I had an instance of that the other day. I was valuing timber on an estate which has been transferred, and the timber in a plantation of 50 acres was worth close on £4,000—roughly £80 an acre. It varied in age from 25 years to 80 or 100 years, judging by the look of it. Half the adjoining farm was of exactly the same character of soil, poor stiff land. I am not now speaking of rough mountain pasture, or anything of that sort, but of fairly low-land country. This land was let to a farmer, with a good homestead (which would cost to-day £1,500 to build), at 7s. 6d. per acre, the landlord paying the rates. I feel sure, judging from the crop and soil on one side of the fence, and the character of the soil on the other, that that land would pay much better if it were utilised for growing ash and oak than it does at present for agriculture.

43. Did you make any calculation as to what the crop on the ground was worth per acre, taking it for the whole time it was growing, comparing it with the agricultural rent?—I should not like to bind myself to the figure, because, to a certain extent, it is an actuarial valuation which I do not feel myself competent to be definite upon in a moment; but I certainly think it would be worth nearer 20s. than 7s. 6d. This place is within four miles of a railway station, within fifty miles of a mining district, and within fifty miles of several large towns. There is a population of some millions within less than one hundred miles.

44. (*Professor Schlich.*) As a general proposition, I should think that if you put the agricultural rent at more than 7s. 6d., the financial aspect of forestry becomes a little doubtful?—From 7s. 6d. to 10s. is perhaps about the figure. The means of transport is one of the most important factors. In fact I consider it the most important thing in a question of this kind. If you have to fell the timber 200 miles away, and it is a low-priced timber at the delivery end, it makes all the difference. If you have to pay, as we have in Yorkshire, 3d. for the carting, and possibly 4d., it makes a great difference. Our firm has paid 5d. per cubic foot for carting Scotch fir in the early seventies, when prices were better than they are now; and it had to be felled, which would make a good hole in another penny. We paid 3d. a foot for the railway carriage, and at that time the Scotch fir was sold at 16d. a foot, but to-day it would have to be sold at 8d. Therefore, the 5d. for cartage and the 3d. for railway carriage would now swallow up the whole of the selling price. This was within the same county, and, as the crow flies, there was a distance of less than 40 miles between the point of production and the place where the timber was consumed. Only recently I was speaking with a man who has been taking down a plantation of spruce, and he is going to deliver it into the market for the owner, and they will share whatever is left after the expenses are paid. He anticipates that they will each have ½d. per cubic foot if he is very fortunate. In this case also, both the growing place and the delivery end are within the bounds of Yorkshire, so that transport is the most important thing, especially with cheap timbers.

45. (*Mr. Stafford Howard.*) You lay great stress on the importance of having good roads for the purpose of extracting timber, particularly in large woods?—Yes.

46. If you were offering to buy timber in some large woods, the question of whether there were good roads by which to get it out, or bad boggy roads, or heavy roads at the time of year you had to get it is important, and you would take all those things into your calculation?—Yes.

47. And it would make a good deal of difference in the offer which you would make?—Yes. It would make a considerable difference; and the railway rate would make possibly even more.

48. I was thinking of it more from the point of view of the owner?—Yes, from his point of view. The cost of cartage might not be more than 1½d. or 2d., but in the case of railway rates it might be 2d., 3d. or even 4d. for comparatively short distances.

49. (*Professor Campbell.*) You use a large amount of British timber, do not you?—I handle a large amount of British-grown timber.

50. And not much foreign?—Not much foreign.

51. Do you find increasing difficulty in getting supplies?—Just recently perhaps one has, especially in the case of good ash and good oak.

52. The home supply is not restricted very much yet, is it?—Yes. I think during the last few years it has been, especially of good ash.

53. Do you look forward to the time when it will be very restricted?—I do.

54. In the near future?—In the near future.

55. Unless planting operations are extended?—Yes. In the case of the best British oak, and in the case of ash, I think if we do not plant, and attend to our present crops better than we have done, and work the whole of our sylviculture on a better system, there will be a scarcity in the near future, especially as regards the higher qualities.

56. From what areas do you draw your supply chiefly?—Principally Yorkshire; but I also go to the adjoining counties. I have bought in Ireland, Wales, and Scotland, but not to a great extent. I buy principally in Yorkshire, because of that old question of cost of transport. One cannot go over very wide areas, because the cost of transport is so heavy that it would not pay to bring the stuff over. Mr. Hopton reminds me of an instance where it was impossible to bring a large quantity of larch from the West of Ireland because of the cost of transport, although larch has a comparatively high value.

57. In your experience, do the persons from whom you purchase re-plant?—Yes, in some cases, but not in all. In a few cases they are already planting on better principles. I have directed their attention to Dr. Schlich's work, and to Professor Somerville's and other people's writings, and I think in a few instances that is beginning to have an effect. For example, I have seen some estates where a few years since they would have planted their trees 5 feet or 4½ feet apart, where they are now planting them 3 feet apart.

58. Now they are planting amongst the roots of the trees which had been cut down?—Yes, but not in every instance. Sometimes it is promised that it should be

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done next year, and when next year comes it is said it may be done next year, and so on, always the year after.

59. They leave their land lying unproductive?—Yes.

60. Do you find an increasing interest taken in forestry amongst landowners?—I do.

61. What is that due to, do you think?—I think it has been a great deal due to the writings of the gentlemen I have referred to, and I believe perhaps one of the most important steps that has ever been taken in connection with British forestry was the excursion of the Royal Scottish Arboricultural Society to Germany in 1895. I believe very few things, if anything, have had such an influence upon British forestry.

62. As the result of that excursion and these writings you think a greater interest has been taken in forestry, and that the subject is more widely discussed?—That is so.

63. I believe you come a great deal in contact with foresters. Do you find that in this country they agree in their opinions?—No; I do not. I find they disagree. There is a conservatism, and a conservatism not of the right sort perhaps. For instance, they stick to the old method of thinning heavily.

64. Of course you are not in a position to say whether they are wrong or not—you do not profess to be a forester?—I have taken a great interest in forestry, and I certainly consider, speaking broadly, that the proper thing is not to thin too much, but to keep an overhead canopy. With regard to training trees, I am told by Mr. Hopton that lopping is better understood abroad, especially in France, as I have heard Mr. Hopton say before; but, in my opinion, natural lopping in many cases, in the case of the firs and the pines, by crowding, produces better results than artificial. It is the case also with the hard woods very often, unless the artificial lopping is done very carefully.

65. Do you think that the English foresters are becoming converted to the Continental methods?—I think so, and I am very glad it is so, but the conversion is not yet complete.

66. But you think there is distinct evidence that they are beginning to be more of one opinion?—I do.

67. And that that is due to writings and discussions?—I am sure of it.

68. In fact, it is due to a general interest being taken in the matter?—Yes. What is required now, I believe, is the instilling of those principles more generally amongst all classes. If we are going to grow timber as a business we might conveniently in the plantations think a little less of the æsthetic value of our woods, not that it necessarily need be much less. We can confine our arboriculture to the parks and go in for sylviculture in the woods.

69. Are you of opinion that trees grown on the English system are of better quality than trees grown on the Continental system?—For certain purposes.

70. I rather gathered that it injured the quality of the timber to grow it on the Continental system—at least, that was the impression on my mind?—For some purposes. For instance, in the case of beech, we get much heavier crops of beech in Germany than we do in this country. When I was on the excursion I have spoken of we saw a crop of beech of 9,700 cubic feet to the acre. Six of us estimated it independently and averaged our results, and that was the average calculation. We did not vary very much. I doubt whether we have many crops of beech in this country of more than 3,000 cubic feet to the acre. German beech being grown like that makes a heavier crop, but there are uses to which beech is put in this country in large quantities for which that beech is utterly unsuitable. For instance, mallets, shuttles, wheel cogs, rollers, and similar products, where density and weight are of importance, English grown beech, grown more thinly on the ground, is of more value. In confirmation of this I wrote to a large customer the other day asking him what his opinion was, and this is his reply, that such German beech as we have was much inferior to our "English beech, being light in weight, too free and open, and it had not that solidity about it that ours had." We can grow beech of the soft quality, and we have little patches of it, and it may be useful for some kinds of work, possibly the High Wycombe chair trade.

71. The point I want to be clear about for my own information is this. Supposing you grow trees on the Continental system, the dense system, and on the English system where they are sparsely grown, would the trees grown on the dense system be inferior in quality to those grown on the English system?—They would for purposes of this kind where resistance to indentation is of importance, or weight is necessary.

72. Have you had any experience of Irish timber?—Not very much.

73. Are you aware whether it is a good quality or not?—So far as I have seen oak it varies, and ash varies pretty much as ours does. I have handled some quite as good quality of Irish oak as I have of English oak.

74. In Ireland there are a large number of small farmers who cut down individual trees here and there. I suppose that the prices obtained for the timber from isolated trees of that kind would not be so good as when you bought a large quantity in the wood?—No, because the cost of handling 100,000 cubic feet of timber concentrated is less proportionally than handling smaller lots. You could handle 100,000 cubic feet of timber much more easily than you could handle 100 lots of 1,000 feet each.

75. So that it would not be desirable to plant in small lots?—It would be more desirable to plant in large areas. If it is possible to get it by any means, Government or otherwise, that is a most important thing: that we should plant in large areas, having regard—it is very much like "King Charles' head" and cannot be kept out—to the ease and cheapness of transport.

76. Small farmers in Ireland, and I suppose in Scotland as well, are strongly advised to plant corners here and there, but you do not think that that is so desirable from a timber point of view?—From a timber point of view, but for other purposes there are most important matters to be considered. There is shelter, which is a very important point. Besides shelter, tree planting, as most of you know better than I do, has a considerable influence upon climate, and I should like to suggest that among other owners, many of our large urban Corporations owning the freehold of the gathering grounds for their water reservoirs might improve the value of their ground, both in attracting and conserving, and perhaps in improving, the quality of, their water, by planting forests, and in the course of time they would have also a valuable asset in the shape of timber. I have seen, in the way of business, large areas, collecting grounds for large reservoirs for the towns, rough pasture, which could not be used very much for farming because of the defiling of the streams. In fact, I have seen an instance where farms have been bought for the express purpose of pulling down or controlling the buildings in order to preserve the purity of the water. In cases like that it seems to me an important thing that the water gathering grounds should be planted with timber. There would be fewer rushes of water in flood time, and the water would be conserved and let down more gradually, and in some cases—of course I am not much of a chemist—I think possibly the quality of the water might be improved.

77. Are the Yorkshire Corporations planting their gathering grounds?—I hear that Halifax is intending to do so. I was thinking at the moment especially of Leeds and Bradford, but I hear that not only Halifax, but Leeds, may possibly plant.

78. Has the Leeds Corporation planted?—Not yet. I was thinking of the Leeds Corporation particularly at the moment, because I have been brought into personal contact, in one way or another, with cases where they have bought farms for the express purpose of doing away with the defilement of the water, and that land is suitable for the growing of timber, if this is done in a proper manner.

79. (*Sir John Rolleston.*) They are buying up the Washburn Valley Watershed now, I believe?—Yes. It is the Washburn Valley that I am referring to now, where they may possibly plant the trees.

80. Is it a very suitable ground for planting?—It is very suitable if done judiciously.

81. (*Mr. J. H. Lewis.*) Which do you consider financially the most profitable crop that can be grown at the present time in the British Isles?—That depends on a good many circumstances. Speaking generally, if the ground and the environment are suitable I think ash is the best thing to plant and conserve.

82. Would you also consider that pit wood, within a reasonable distance of colliery districts, would be a profitable crop?—I have my doubts. I am speaking now from my local experience in Yorkshire. It may be more profitable in Scotland and Wales to grow pit wood than it is in Yorkshire, but we are so heavily

handicapped in the way of transport that it does not seem to be a profitable timber to plant in that district.

83. Do you consider that larch disease makes larch at the present time too risky a crop to cultivate?—Yes, I do, unless the newer kind, Japanese larch, is proved to be more proof against it than the older kinds.

84. With regard to education do you find amongst the older foresters any prejudice against novel methods and against education?—Yes, I do.

85. They prefer the rule of thumb methods?—Yes, "what their fathers have told them."

86. But I think you said that that prejudice to some extent was disappearing at the present time?—It is but not so much amongst the older foresters as among the rising generation, and perhaps more particularly amongst the owners.

87. In travelling about the country have you noticed whether spoil heaps are being planted to any great extent in colliery districts, where large areas of spoil heaps are left?—I have seen very few spoil heaps planted, and I see a good many of them. Many of the collieries are too near to the manufacturing towns for any efforts of that kind to do much good; there is a pollution of the atmosphere which, combined with the poor soil, would, I am afraid, prevent in many cases any tree thriving at all.

88. But I presume there are districts in which, if either the colliery proprietors or the landowners became thoroughly interested in the question, it might be possible to plant on a very considerable scale these spoil heaps, and so convert them from spoil heaps to places of beauty?—Yes, that could be done. I have seen one or two instances where it has been done with very good effect. Although not perhaps growing the best of timber, still it does away with the ugly look of the spoil heaps.

89. Supposing that owing to the stimulus of interest in timber growing in this country extensive areas were afforested, what effect do you think that would have upon rural labour?—I think it would bring people back from the towns, and encourage to stay on the soil much of the labour which is at present drifting away owing to lack of employment and lack of interest, which is cumulative, in that as a district gets depopulated there is naturally less human interest to keep those who still remain on the spot.

90. You think it would have a tendency to keep them in the country?—I do.

91. And with improved methods of education do you think it would give them a greater interest in their work than they now have?—I think it would. It may be perhaps going a long way, but I should like to suggest, if it were possible, that some influence should be brought to bear on those who have the making of children's reading books. A little chapter or two possibly, written by someone who knew what he was saying, might be the means of stimulating in early life an idea of general principles in growing trees. Perhaps the American Arbor Day might be a useful institution to introduce into this country.

92. Is it not the fact that the work in connection with afforesting fills up the labourer's year; that is to say, it gives him work at a time of the year when no most stands in need of it?—That is so. At harvest time as a rule there is not much work in the woods, but in winter when there is not quite so much field work he is wanted in the woods. I find that the men I employ locally, apart from the men I take from my own place, are just the men who are busy among the farmers in the summer, and are very glad to have a fall of timber going on in the district in order to employ them at what would be otherwise slack times.

93. (*Professor Schlich.*) I should like to ask one or two questions to bring out some points a little more clearly. You said in your evidence that, for certain purposes, timber grown in this country is superior to that which we get from abroad?—Yes.

94. What kind of timber does that chiefly refer to?—Speaking broadly, hard woods, beech, oak, ash, and I think I may include elm, but I should not be certain of elm.

95. Am I correct in saying that it chiefly refers to the hard woods?—It chiefly refers to the hard woods.

96. Do you happen to be able to tell me in a rough sort of way what would be the difference in price between English grown beech and German grown beech per cubic foot or ton: the proportional value in the English market?—German beech would be 60s. to 80s. per load of 50 cubic feet.

97. That would be an average of about 70s.?—Yes, about that. British beech would be from 55s. to 65s. I have delivered scores of thousands of feet of trees, not butts—I am speaking of round timber. I am delivering English round timber to-day at 13½d. per cubic foot.

98. That would be practically something about 60s.?—Yes.

99. You are speaking of round timber?—Yes.

100. But that will not afford a means of comparison?—That is taking the whole tree as far as it is measureable.

101. Supposing you cut the same sort of stuff in one case out of the English beech, and in the other case out of the German beech, could you give me an idea how much per cent. more you would get for the English beech than the German beech—5 per cent., 10 per cent., 15 per cent., or what?—Perhaps I had better ask Mr. Hopton, who has had more experience with German beech than I have, to answer that.

102. We will consider it as received from Mr. Hopton. (*To Mr. Hopton.*) Mr. Margerison made a point that for certain purposes English-grown beech is more valuable than German-grown beech. I should like to get an idea of what is the approximate difference in the price between the two, the same class of stuff?—(*Mr. Hopton.*) English butt beech, that is the prime part of the tree, for pianoforte making and other purposes, would realise from £5 to £5 10s. per load. There is no German beech that I know of which will take the place of English for that purpose. But for chair-making, English beech will sell at from 60s. to £5 a load, whereas German beech will sell from about 60s. to 75s. or 80s. a load.

103. Then one might say one would be 70s. and the other about 80s.?—(*Mr. Hopton.*) Yes, for the same purpose.

104. That would be one-seventh more?—(*Mr. Hopton.*) Yes, or about 14 per cent. What I am referring to now is where the wood is required of greater density than the German wood is required for, because the English beech is far denser and of greater tensile strength than the German.

105. (*To Witness.*) The point I am driving at is this: If you get 15 per cent. more, taking a round figure, for English beech as compared with German, you agree that in beech grown under the German method, if you get 15 per cent. more timber, you are just as well off as you were before, and if you get 20 per cent. or 25 per cent. more timber per acre, you, of course, make more profit?—(*Witness.*) In quantity, but not in quality. The German beech would not be suitable at all for the purpose.

106. I am looking at the financial aspect of the question?—Financially you would get better results from the German system than you would from the English.

107. As regards conifers you are strongly of opinion that the imported timber, generally speaking, is considerably superior to what we grow in this country?—I am quite sure of that.

108. And you refer especially to firs and pines?—Yes. I do not know any reason why we cannot grow them; in fact, I think we can.

109. We shall come to that. I want to draw your attention first to the fact that of the imports of timber into this country 87 per cent. consist of firs and pines?—That is in bulk, not in value.

110. That is the official return. Now what I want to bring out is this, that as far as British forestry is concerned, do you agree that the production of coniferous timber is of the first importance, of far greater importance than the production of hard woods?—There is no doubt that it is more important, but there is no reason why the two cannot be carried on together. It is more important that we should produce a large quantity of coniferous timber than of hard woods.

111. That is my point. The next thing I want to lead you to is this. You have in your paper, and I think in your evidence, said that when you deal with coniferous timbers, pines and firs, the cost of bringing it to the places of consumption, or where it is worked up, comes practically to the same amount as you would pay for the original cost of the timber where felled?—Yes, that is so.

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112. What we have to try to do is to produce coniferous timber in such a way that it could be delivered at the place of consumption at a very considerably reduced rate?—That is the point.

113. So as to reduce the percentage or the proportion between the cost of bringing it and the cost of production?—Yes. The cost of handling our English conifers is often 90 per cent of the selling value. That is chiefly a question of transport. I could give you scores of instances where the timber has cost 90 per cent. of its selling value in getting it from the plantation to the consumer.

114. On what would the reduction in the cost of bringing it to market principally depend? Would it depend in the first instance on the fact that a large quantity of timber was produced in one particular locality?—Yes, and then in persuading the railway companies that they should give some facilities for native produce of the same kind that they give to foreign.

115. The greater the quantity you have to cut in one and the same locality, the better arrangements you can make for transport, say to the nearest railway, or to where you utilise the timber?—Yes.

116. You can have a more complete arrangement in sawing machinery for cutting up?—Yes.

117. If you have more permanent arrangements for working up the timber in the locality in which it is grown, the reduction in the weight and the transport is very considerably reduced?—Yes, it is.

118. Have you any idea, taking it altogether, what that would come to?—No; of course there is not so much waste to carry.

119. Would that waste reduce the weight 30 or 40 per cent.?—In converting round timber into square the waste can be very easily from 20 per cent. to 33 per cent., but that waste may be used as fuel.

120. In other words, you would reduce your cost of transport by 20 per cent. to 33 per cent.?—Yes.

121. Say 27 per cent. as an average, and that would be a considerable saving?—That would be a considerable saving.

122. If we had concentrated areas of some considerable extent, would it not generally increase the competition for that timber?—Yes.

123. Would it not be likely to reach higher initial prices, if produced in considerable quantities in one and the same spot?—Yes, where there is facility for transport. Of course, if the transport, as at present, cost more than the selling value, I do not think it would affect it to a very great extent. If there is not much margin to begin with there is not much room for competition. When it costs as much to bring timber from the North Riding of Yorkshire to the West Riding as it does not from the Baltic or even from Canada, there is not much room for competition even with the larger quantity of the produce. There is not much room to improve prices.

124. But supposing your imports from the Baltic or Canada should fall off?—Then comes the opportunity for British growers. I do not put this forward from personal observation, but from statistics, that crop apparently is getting less, and in other countries it is getting much more remote every year, and the timber famine is, I think, within perhaps not measurable distance, but appreciable distance.

125. You have already told us in your evidence that you are most anxious that an improved method of forestry education should be introduced into this country?—Yes.

126. There is the working forester, the proprietor, and the estates manager?—Yes.

127. Would you consider it more important in the long run, in the first instance to instruct and enlighten the proprietor and the estates manager, or would you consider it of more importance that the workmen should be better instructed?—I think, looking at it broadly, that on the whole it is more important that in the first place you instruct the owner and then the manager.

128. I am pleased to hear you say so?—After the owner perhaps the keeper. The reason I speak of the owner is because he would have control over the keeper. If an owner is instructed I think much of the other will follow.

129. I am very pleased to hear you say so. You are quite clear that the most important matter is to instruct the owner?—Yes, or whoever has the control.

130. That is the principal point I wished to bring out?—The other will, I think, follow. It is important that the forester should be instructed, and instructed thoroughly.

131. If the owner is instructed he will see that his forester gets instructed too?—He will. With regard to teaching botany in schools and in universities, although it is fairly extensively done, I think botany should be taught with special reference to sylviculture, which is a very important thing to aim at.

132. We are going to have both, I hope?—I hope so.

133. I only wanted to know which you considered the most important?—I think a most important point to keep in view is that the remuneration of a forester should be higher than it is at present, so as to attract a higher class of men, and warrant a man in going in for a somewhat costly education. I think, if I am not wrong in my recollection, in Germany the forester is a combination of a forester and game-keeper.

134. Yes, to a certain extent?—A combination seems to be the ideal thing, but he should be a forester first and a keeper secondly. An important point I think is the distribution (especially when you come to educating agents and foresters) of forestal education over wider areas. When you come to educating the agents and the foresters the means of education should be available in many centres. Coopers Hill and Edinburgh, looked at from the general standpoint of forestry education in this country, are bright spots, but we might have bright spots in Yorkshire, in Birmingham, in Manchester, and in various other places where people who are locally interested may have opportunities to learn true principles.

135. Apart from Coopers Hill, do not you think that the instruction of the proprietor might be more concentrated?—Yes, that might be, naturally.

136. Whereas the instruction of the working forester should be distributed over the country; I understand that is what you mean?—Yes, that is so.

137. (*Colonel F. Bailey.*) The one or two questions that I have to ask relate almost entirely to the transport question. You said that the growing of pit wood was not likely to be profitable in Yorkshire because the cost of transport was so high as to be practically prohibitive. But the miners who are using timber have to get timber down to the mines somehow or other, and they have to pay for it?—Yes, they prefer a smooth light wood.

138. Smooth round timber?—Yes; even a miner does not like to scratch his hand with a knot.

139. It is not altogether the cost of transport, but rather the question of the suitability of the material?—Yes; no doubt it is partly, but I think it is principally the cost of transport.

140. Why cannot we compete with the wood that they get, the smooth stuff received from abroad? It has to be got, and they have to pay for it?—But ours costs so much in handling.

141. It is really a question of the comparative rates, the favourable rates granted to foreign timber?—That is so. This is a point upon which I should like you to question Mr. Hopton. There is a system of granting bounties on exported timber from other countries, but it is a point on which I have not much information myself, and one on which Mr. Hopton can speak.

142. We shall be happy to hear him on this?—It is a thing of which I have no personal knowledge, but I have suspected it. As I have said, the British timber trade has so many ramifications that one man cannot possibly know every branch of it.

143. You have said that it is not only a question of the heavy rates imposed for the transport of British timber, but it is also because foreign timber is more suitable for mining wood?—That is a very important point. Both causes operate unfavourably.

144. If we grew our pit wood in a manner different from the present method of growing it, we might produce something which would be much more acceptable to the miners than that which we now offer them?—I believe that is so; in fact, I am sure of it.

145. That is important. You mentioned just now that 5d. per cubic foot was the sum you paid for carriage or cartage?—I gave that as one instance where we paid 5d.

146. What do you mean by "cartage"—do you mean using a cart on wheels?—A timber waggon from the plantation, as distinguished from railway carriage.

147. Through the forest, picking up the timber, and carrying it somewhere?—Yes taking it to a railway station.

148. I daresay when you paid that high rate you found these trees scattered about?—No, this was all in one plantation, within a ring fence.

149. How far did you have to take the timber?—Ten miles.

150. That is a long way, is it not?—It is a long way; it was through a rough country.

151. You are aware, no doubt, that in other countries, where forestry is organised more than it is here, and where the trees are grown in large masses—I do not mean density only, but over extensive contiguous areas—that many means of cheapening and facilitating transport are introduced. For example, slides, shoots, or tramways, or such things as that?—Yes.

152. And you have seen, I daresay, that it would be impossible to organise any such systems of transport unless you had, in the first place, large areas, and, in the second place, dense stock upon them, and, in the third place, a regular system of management?—That is so.

153. So that it seems—and I should like your opinion upon this—that even if we actually got a very great cheapening of those heavy items of transport, if we grew our woods on large, extensive, and contiguous areas, densely packed with wood, and had an organised system, it would be better?—Yes, that is a very important point in improving our sylviculture.

154. There is another point I should just like to call your attention to. You drew a comparison between the prices charged, I understood, by railways for conveying timber, and I think you put it from Gloucester 6s. for imported deals, and 11s. for English round timber?—Yes, that is what is quoted by a member of the Timber Trades' Federation.

155. You mentioned also that the imported deals were 66 cubic feet to a ton?—Yes.

156. And that English round timber was 40 or 50 cubic feet to the ton?—Yes.

157. I suppose in the latter case the English round timber was measured by quarter girth?—Yes, quarter girth, tape over bark, probably.

158. You are aware, of course, that you cannot compare these two items at all—the unit of cubic foot in squared timber and that from the quarter girth in round timber are not the same thing at all?—I quite realise that.

159. That seems to be a very important thing. Before you can make a fair comparison you must reduce them to similar terms?—Yes. Foreign square timber and foreign round timber are carried at similar rates, or rather not quite similar rates, but there is only a slight difference. The general classification is deals, battens, and boards, 66 cubic feet to the ton, and then sawn into planks, measurement weight. I think it might be useful to the Inquiry if we were to put in an extract relating to timber from the General Railway Classification of Goods for this year. (*Appendix IV.*)

160. Is it not the case that railway companies charge a higher rate per cubic foot, or a higher rate per nominal ton, when you take the quarter-girth measurement?—That is so; it is placed in a higher class.

161. If you take 40 or 50 cubic feet to the ton, then you have to pay a higher rate?—Yes, than in the case of deals. But it is the same measurement in the case of foreign round-timber: the same system of measurement as in the English round-timber measurement.

162. (*Sir John Rolleston.*) Do you purchase home-grown timber for general purposes?—For general local purposes; but, as I said before, the English timber trade is very much a localised trade, and one cannot speak for every branch of it.

163. But the greater part of your trade is in home-grown timber?—Yes. It is practically all home-grown timber.

164. I understood the answer that you gave in your examination by the Chairman was hardly the same that you gave to Professor Schlich as to what sort of timber you recommend landowners to plant. I understood you to say ash and oak, which, I suppose, are timbers for which you have the greatest demand?—Yes. From my own personal experience those two are the most important so far as getting a certain value per acre is concerned; because the price per cubic foot is higher. The demand in volume is not so great for the hard woods as it is in pines and firs.

165. But the supply is short, is it not?—The supply of best quality ash is short at present.

166. Is the price of ash and oak very much what it was 30 years ago?—Pretty much what it was, especially ash.

167. Scotch pine you said was half; 8d. against 16d. I think you said?—Yes, I am speaking of West Riding prices for timber delivered.

168. Therefore, in your opinion, the most paying trees for landowners to plant would be ash and oak now?—In districts where the demand is for ash and oak more particularly. I do not speak of what may be the best thing to plant, say, in Scotland, where an estuary may run far inland, with shipping facilities to perhaps some of our colliery districts in other parts of the kingdom. Possibly the best thing in that case would be to plant mining timber.

169. Props?—Yes, pit props, and to properly grow firs and pines for building timbers in anticipation of the time when our foreign supplies may be running out. But, speaking from local experience, where the land is suitable, simply because of the prices per foot being higher (I do not think the one statement really conflicts with the other), ash and oak fetch higher prices, and are more in demand at present for local purposes.

170. In Gloucester, probably, ash and oak would be the best trees to plant?—I think they would be. Of course, the Gloucestershire oak has a high reputation.

171. Do you buy hedgerow-timber?—Yes.

172. How does the quality of hedgerow-timber compare with the timber from plantations and woods?—The bole is harder, tougher, and perhaps it is not always so white; but that depends on other circumstances, and is not necessarily a defect. The top is rougher, and of less value except for some purposes. A curved top would produce a curved timber for felloes and things of that kind. Speaking broadly, where short lengths are required, hedgerow-timber is more valuable for its toughness. This I have not tested by machine or anything of that kind. Where long lengths are required, plantation ash is the best.

173. Hedgerow-timber is a favourite timber of your's, is it not?—Yes, for cart shafts.

174. The transport of hedgerow-timber is usually easy, is it not? It is grown where there are farms and roads about, and so on?—Except at certain periods, when the farmers' crops are on the ground, it is easily got at, of course.

175. A crop of hedgerow-timber is certainly worth the attention of landowners?—Certainly; and I think where trees are felled in the hedgerows for the convenience of tenants, which is very often done, it is advisable that trees should be replanted so as to follow on and take the place of those which have been felled. In consideration for the farmer, I am not quite sure that ash is the best timber for that purpose; but for the grower and the user, ash-timber is perhaps the best. A farmer will tell you that ash robs his land more than anything else.

176. It would not matter much on pasture, would it?—It would not matter so much on pasture, or, at any rate, it would not be so evident.

177. Do you supply any timber for paving purposes?—No, but I know people who do. There are paving blocks made of English oak-timber. Mr. Stenning, the Chairman of our Federation, does a large business of that kind. The blocks are made of English oak-timber, built up.

178. It is the practice of the large towns now to go to the forest instead of to the quarry for paving material?—Yes.

179. And it is becoming more usual for them to do so?—It is becoming more usual.

180. English oak-timber is a good paving material, is it not?—It is perhaps the best.

181. Is there any other English timber that will do for that purpose?—Yes. I should think elm would do, because it stands alterations of wet and dry conditions.

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182. Would any of the conifers do?—I do not know. I should think, myself, they are just as good for that purpose as foreign if they are creasoted, and a creasoting plant on an estate is a paying concern. With regard to creosoting, Mr. Havelock, who, I believe, is coming to give evidence, can give you some information from his own practical experience.

183. My point is that there is an enormous demand now, and likely to be a much larger demand for timber for paving purposes, and my desire was to elicit from you if there was any English timber which could be grown to supply that demand?—I do not see why the English conifer should not be really better for that purpose, although perhaps not so good for building purposes, and that sort of thing. Even English conifers grown under the present system I think may be possibly better than foreign conifers. This is a new point, and I am speaking on the spur of the moment, but still I am strongly of opinion that our harder English conifers may be better for paving blocks than foreign conifers.

184. Would there be a supply if they were proved to be of value for that purpose?—I do not know whether there would be at present a sufficient supply.

185. Did you happen to supply the gate-heads to the Manchester Ship Canal for the locks?—No; but I have supplied a large quantity of oak for railway waggon-building purposes, and one or two of the wider-awake railway companies prefer English oak to any other for sole bars.

186. I was only interested to know if you supplied the large timbers for those locks?—No, I did not. Are they English timbers?

187. Yes, English oak, and they had great difficulty in finding them?—I did not remember that. One of my customers told me that he built as an experiment—a very useful experiment—twelve railway waggons, in six of which the framework was of English oak, and in the other six the framework of foreign oak. By the time the English oak framework came in to be repaired, the foreign oak waggons were completely finished. That is a very strong point. All the twelve waggons were used at the same time for exactly the same purpose.

188. That bears out your point as to the durability of English grown oak and its toughness?—Yes.

189. (*Mr. G. Marshall.*) On the subject of railway carriage, you have been a member of the English Federation, and you have also attended the Board of Trade Conferences, and the Clearing House Conferences, and you have had several very hard fights with the railway companies?—We have.

190. Have you had many concessions from them so far?—We were very glad in 1893 to get back to where we were.

191. Then you got practically nothing from them?—They were putting on to us from 20 to 300 per cent., and the thing came with such a crash at the time that we were very thankful indeed to get back to where we were.

192. And since then you have had no concession?—No.

193. Competition then is the only opportunity you have of making a good rate—when two lines run from the same place?—That is the only chance; but now we cannot even get that, because the Railways' Association has so combined most of the railway companies that one company will not do anything without consulting the others.

194. The only thing that can possibly help you in the way of getting your troubles alleviated in that way would be an Act of Parliament?—That is all. As a federation we have promoted three Bills, all of which have been simply blocked.

195. You mentioned in part of your evidence that you would not recommend larch being planted closely together?—I have an idea that larch is not quite so shade-bearing as some of the other conifers.

196. It was not for any fear for the larch contracting the larch disease?—No, although, of course, that question does possibly come in.

197. You kindly gave us a comparison between the English oak and foreign oak, as used for the construction of waggon trucks. May I ask you whether the large railway companies are using much English oak now for their carriage building, or are they using foreign oak in preference?—Many of them are using foreign oak in preference because of the price, I think. But one or two of the better class railway companies see further, and are using English oak. They pay the higher price for it.

198. I know that some years ago a large quantity of the best of the oak timber grown in the South of England was bought by the North Eastern Railway Company, and they shipped it to Goole and Hull, took it on to York, and then converted it themselves. Do they still buy the same quantity of English timber?—They still buy large quantities.

199. Is that the same sort of good quality timber that they used to buy, suitable for making sole bars, long lengths?—They still want the same quality, and if anything they are making the specification more difficult to fill.

200. On the whole, you think that all the time there is good oak timber to be had, and there will be a certain demand for it in England?—Yes.

201. And that whilst people can get good English oak they will not use foreign unless they are induced to do so by the difference in the price?—Exactly.

202. That is your view?—Yes.

203. You said you had rather a difficulty in getting oak timber. Are you aware that the timber merchants in the South of England are rather overstocked this year with timber, and are, in fact, not taking the lots offered to them; in fact, there is rather a slump in timber in the south?—Did I say there was any difficulty in finding timber?

204. I think you said you had not always got as much as you wanted of the hard woods?—We have not the same quantity of large, long, hard wood, but I do not think there is yet much of a famine. We have occasional lots, but I do not think there is much of a famine.

205. Let me put the question in another way. Is oak timber selling in the North of England as well now as it was last year?—No.

206. There is a fall of price?—Yes; there is a fall of price.

207. How do you account for the sudden fall in prices? Is it because there is more timber in the market than the timber merchants can dispose of?—I think it is the old question of supply and demand. People are not buying timber so freely during the last twelve months, just as they are not buying other materials.

208. In spite of all that, you are still of opinion that if good English oak timber and good English ash timber can be grown in England, as far as you know for many years to come there will be always a good demand for it?—Yes, I believe so, judiciously felled. Sometimes there is a large quantity rushed into the market, and at other times there is scarcely any.

209. Then the theory that large quantities are better to deal with than small quantities does not hold unless judiciously felled, or if rushed on to the market?—Large quantities irregularly marketed.

210. (*Dr. Somerville.*) I should like to get a little more information out of you for the benefit of this Committee about the railway question and rates. I suppose you agree that, other things being equal, 50 cubic feet of square timber contain the same amount of material as 40 cubic feet of round timber?—It depends on the divisor you have used. The 144 divisor as against the 113 divisor would give different results.

211. I do not want to make it at all an intricate question, but I understand that if the timber is measured on the quarter girth system you will really get 25 per cent. more wood than is put into the figures. You get the slabs in fact in addition?—No. If the timber is absolutely cylindrical you would do that, but this is very rarely the case.

212. But even the quarter girth measurement system is supposed to take that into account. It is not measured at one end and at the other, but it is measured in the middle?—Yes, but you do not always get the trees round.

213. Still, speaking generally, without going too much into detail, is it not a fact that you get about 25 per cent. more?—No, although if the trees were cylindrical or exactly circular in section you would.

214. You have already told the Committee that if you cut up round timber you would lose from 25 to 33 per cent. in the cutting?—Yes.

215. And that 25 to 33 per cent. goes in slabs and in sawdust?—Yes.

216. Then you will not allow me to say that you agree with me generally?—No, not that the 144 divisor gives, generally, so much advantage over the square.

217. If you will not agree with me then you bring me to a stop?—I am not quite sure whether we are working on the same question.

218. May I take it in this way? You have a stick that is a cylinder; you measure that stick by the quarter girth system and make it to be 40 cubic feet. You then put it on to the saw bench and you cut it up, and you throw aside the slabs and get a square block of timber. Would not you get 40 cubic feet in that square block of timber?—If the thing was perfectly cylindrical you would get a considerable portion of it.

219. But you would get practically 40 cubic feet?—I should not like to say that.

220. You would throw aside 25 per cent. of slabs?—Say a third—33 per cent.

221. Part of it would be sawdust—say 25 per cent. of slabs, and 8 per cent. of sawdust, that is 33 per cent. Under ordinary calculations you have 25 per cent. more of wood material in round timber than is expressed in the volume?—If it be exactly round. A large proportion of our timber is fluted and irregular or oval in section, and there is consequently a reduction in cubical contents.

222. And yet in connection with railway rating you say that for round timber they take from 40 to 50 cubic feet quarter girth measurement to be a load, and 66 cubic feet if it is in the form of deals?—Yes.

223. In place of that being 25 per cent. more it is really 50 per cent. more. How do you account for this great difference? Is it not a fact that when the timber is round it not only contains the slabs, which are not taken into account, but also contains a great deal of moisture, and is wet and heavy?—Yes, so are deals when they first come in.

224. But still round timber contains more water than square?—Not necessarily. You will sometimes have timber which has been lying felled a couple of years, and it gets very dry. Pitch pine which has been laid in the timber yard in a pond is far heavier than the average of our British timber.

225. I am taking the case of the timber as it comes out of our woods, and is round, and as it is put on to our railways, and I ask, Does it not contain a great deal of moisture, and do not the railway companies take account of that in the rates?—No doubt they do, but that is not the average.

226. Why is it that more timber is not manufactured in the wood, squared, and got on to the railways at an apparently lower rate of carriage?—It is a difficult thing in the case of hard-woods, say ash and oak. It perhaps saves more to use the heavier sawing machinery in the towns which produces a finer cut. It saves the waste of sawdust, and there are also the longer lengths of timber near the customers, and that timber can be cut into suitable lengths according to special requirements. In fact it is more convenient altogether for the higher grade timbers than when you work in the open country. Again, few landowners care to have a saw mill in the middle of their estate, perhaps in the middle of their game preserves. But I believe they over-estimate the disadvantage.

227. I suppose you could burn the slabs, could not you, for the steam engine?—Yes, with a special fire-box.

228. And would not the slabs just about manufacture the wood?—I believe they would very often.

229. I suppose that the slabs would be probably as well disposed of in firing the boiler as in being taken to town, having railway carriage paid on them, and cutting them up to sell for firewood?—Yes. This would work in the case of cheap timbers, the conifers and things of that sort; but I do not think it would work quite so well with hard wood, ash and oak.

230. Do you employ steam haulage much on roads?—I do not personally.

231. Do you believe there are any advantages in it as compared with horse labour?—I am told there are; but I have had no personal experience, and I should not care to make a definite statement.

232. Do you find steam haulage by roads is common in Yorkshire?—No.

233. I do not mean for timber specially, but for other forms of haulage?—It is fairly common now for bricks, stone, and that class of thing, for which steam lorries are used.

234. Do you believe that the Local Authority Regulations interfere much with steam haulage, that they schedule bridges to such an extent that the steam engines have a difficulty in getting from place to place?—Yes, I believe they do.

235. You have perhaps known instances of bridges being scheduled for a long time, and no steps being taken to put them in such a condition as to allow the engines to get over them?—I have.

236. I suppose you agree that these restrictions must limit the use of such forms of haulage?—Yes.

237. I suppose it would be possible for a local authority to keep a bridge scheduled for some years simply to keep the engines off the road?—It would be.

238. But you would not suggest that such a thing was ever done, would you?—I should not like to make a definite statement, but one cannot help wondering when one sees things in a certain state for a length of time.

239. You said that for certain purposes English hard-wood was preferable to hard-wood grown in closer forests?—Yes.

240. I suppose these purposes are, on the whole, limited in extent? Timber is better if it is clean grained than if it is coarser?—Yes; a larger volume of timber is used for purposes where long, clean grained timber is required than for other purposes, where density and weight and toughness are required. Still, a large quantity of the dense timbers is wanted.

241. Supposing that English forestry underwent a process of improvement which resulted in the production of a large amount of fine timber, you would not, I suppose, suggest that certain areas should be kept open for the production of this rougher timber, but rather you would say that this rougher timber can be got in sufficient quantity from the hedgerows and from woods that are accidentally made open by wind, and so on?—Exactly, and the fringes of the wood on the windward side, especially on high ground.

242. But you would not make that a specific object of sylviculture?—No, I should not.

243. You think you would get a sufficient quantity of timber, in fact, under a natural process?—Yes. I am glad you asked that question, because I think we should by accidents and environments get quite sufficient of that class by sticking to the system which would give us long, clean lengths.

244. Do not you think that railway carriage for home-grown round timber is put higher on account of the awkward shapes that the trees often have?—That is one reason they give us, and, I think, with a certain amount of truth. I do not want to say that the whole fault of this is the fault of the railway company. I think there is a certain amount of risk in the dangerous character of the traffic. Native timber is often knotty and rough, and so on, and it makes a comparatively light and somewhat dangerous stuff for a load. On the other hand, my personal experience, and that of other people in the trade, is that even if you offer to prepare the timber in such a way that you can get loads per truck equally safe and equally large as those of imported timber, you do not get any concessions.

245. I suppose you would get the same rates, would not you, for square English timber that prevail for square foreign timber?—Between the same points we should, but not from intermediate stations. This is perhaps the essential point: We should not get the same rate per ton per mile for intermediate stations that we should from ports.

246. But I suppose, on shorter runs—and intermediate stations, of course, mean shorter runs—the terminal charges, shunting, waste of coal, and knocking about, are necessarily greater than from ports?—Yes. They put a heavy charge on for that. But, in the first place, the land for these intermediate stations is not so costly; it is considerably less than for port stations, and some of the terminal charges ought not to be so high.

247. You seem to strongly recommend the planting of ash?—Yes.

248. I suppose you find that ash varies in quality considerably in different places?—That is so.

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249. And that certain ash, which appears to be all right, turns out very "tender"?—Yes.

250. Do you happen to know what relationship there is between this tenderness and the situation of growth? Can you tell by looking at a tree from the outside whether it is likely to be tender or not?—I think the appearance of the bark would be usually a sufficient indication to me.

251. Are you much troubled with the occurrence of shake in trees, more particularly oak?—Yes.

252. Do you find that shake prevails a good deal?—I do. I think there is more in some districts, and on some soils, perhaps, than on others.

253. Is that the star shake?—Both the star shake and the cup shake.

254. Do you happen to have any views with regard to the origin of shake?—I am rather dubious about being positive with regard to them. I think I can say pretty certainly what accentuates them, from what I have seen.

255. What?—Frost. I have actually seen a tree, and heard it extending a crack during a frost, after a heavy rain, when the shake has had water poured into it and a sudden frost has come on. The sound of it drew my attention to it. I went to see it and could actually see the shake enlarging. But as to the beginning of the shake I should be rather dubious in answering. One would not like to give a positive opinion. It may be perhaps rapid growth at a certain period, followed by sudden contraction from cold. Perhaps thus separating the new wood from the old might have something to do with it; but I do not want to be positive on that point.

256. You found, I suppose, in your Continental trip that oak is very often grown in association with beech?—Yes.

257. You do not find that so much in this country?—No.

258. But you have taken oak trees out of beech woods, I suppose?—Yes.

259. Do you find the quality of the oak is good under such circumstances?—I think it is.

260. You would, in fact, say that if you had an oak tree of a certain volume from a wood well supplied with beeches, the probability is that that would be good?—I should.

261. Would you also say that it would be less liable to shake?—I have not noticed that. I am not quite sure from what I have seen of timber in that way that the beech would be always as good. I am speaking now from local experience. It is a case where perhaps some other factor comes in, and I have not paid special attention to it.

262. Another point I wish to ask you a question upon is as to whether you have ever come across a case in Great Britain where the purchaser of the timber was under an obligation in his contract to replant the area after deforestation?—No, I have not.

263. Do you find that rabbits do a great deal of damage?—I think rabbits are the greatest curse the forester has to contend with. Rabbits and forestry cannot go on together.

264. We all know that they destroy young trees, but as a purchaser of mature trees do you ever find the effects of rabbits persisting after the trees are 40 or 50 years old?—I do. I had a very striking instance some years ago. In fact, it was at a trial where claims were made for some hundreds of pounds for damage done by rabbits to trees which averaged over 30 cubic feet. In some cases they had eaten off the bark completely round the trees.

265. They had eaten the bark off those large trees?—Yes.

266. Supposing a tree when about two inches or three inches in diameter is rather severely barked by rabbits, and 50 or 60 years later you bought that tree, would you expect to find incipient decay at those places where it was barked by the rabbits?—Yes.

267. In other words, the effects of the rabbits are not confined to the nibbling of young trees, but the effects are to be actually witnessed 50 to 100 years afterwards in the comparatively unsound condition of the timber?—That is so, and that might be continued right through the tree, and possibly not show on the outside. I am told by those who have studied it—I am not much of an ornithologist myself, nor much of a naturalist—but I am told in many ways our keepers are too keen in destroying weasels and owls. Birds are great friends of the forest because they destroy the mice that eat the seeds of trees. Also many of our largest insectivorous birds, such as jays, magpies, and jackdaws, are destroyed when it would be wiser to protect them. Moles also consume a large quantity of the larvæ underground, and it might be advantageous in certain parts to protect them also. education would help owners and others, and points upon which, as I say, in the German forestry schools, the Continental forester is far better instructed than we are. Forest museums scattered about the country would give very useful object lessons.

268. (*Mr. J. H. Lewis.*) Are you well acquainted with the north and south of Wales?—Not well acquainted.

269. Are you sufficiently well acquainted with Wales to be able to say whether there are large areas of land which might with advantage be planted?—I am sufficiently well acquainted to be able to say that in a general way. I feel pretty sure about it. There is no doubt about it.

270. That might be profitably planted?—That might be profitably planted.

271. (*Professor Schlich.*) I am very much interested in the financial aspect of the business, because I think success or failure may turn ultimately on the question whether it will pay or not. You have been good enough to say in answer to Sir John Rolleston that you consider the growing of oak and ash the most profitable crops?—Yes.

272. What is, at the present moment, the average price per cubic foot of oak and ash?—One hears of prices such as 3s. 6d. per cubic foot in the forest for ash, and 2s. 6d. for oak, and perhaps more. But these are exceptional and local prices, and 1s. to 1s. 6d. are more usual.

273. I am not particular about a few pence. You say ash will fetch more than oak?—It depends upon the local demand.

274. Would you say that ash would certainly fetch as much as oak?—Yes, I think it would to-day; generally quite as much.

275. I am not particular as to a few pence?—It depends upon the local demand.

276. Taking it all round, you think that ash might fetch at least the same price as oak?—Yes.

277. At what age do you consider ash would mature?—Generally speaking at about 80 years.

278. At what age do you consider oak would mature?—At 120 to 160 years.

279. Would there be much difference in the number of cubic feet per acre that you would get from the one or from the other?—That is rather a difficult question to answer.

280. Would there be a decided difference?—I do not think there would be a decided difference; it would depend upon the suitability of the soil to the tree, and of the tree to the soil—on the environments generally.

281. If you got the same price per cubic foot, or if anything a little more for ash, and if there is no decided difference between the number of cubic feet, and if you harvest one at 80 years and the other at, say, 140 years, why do you throw the two together as regards the financial results? Do you not think that the one is about five times as profitable as the other?—It would be much more if the prices kept the same; but so many changes occur in the period covered by the life of a tree, and English oak, speaking broadly, seems to be getting very much less common than it used to be. I think the price of English oak may be higher in 80 or 150 years. I do not, however, care to prophesy to such an extent. It is yearly being more and more used in high-class architecture, and is still much used for many purposes.

282. Do you admit that ash would be eminently more profitable than oak?—Yes, under present circumstances. I think I said that for the most profitable timber, where the soil was suitable, ash was the thing to plant.

283. You think that ash and oak together are profitable crops?—Yes. I do not mean necessarily planted in the same woods.

284. With regard to pit props—you would agree to cut them at the age of 40 or 45 years?—Yes.

285. And even if you got a smaller amount per cubic foot at 40 years you would get more cubic feet in twice 40 years than you would get in an ash crop in 80 years. Do you think that pit crops might be just as profitable as ash, and certainly more profitable than oak?—It depends upon the local conditions. If the soil is more suitable for growing ash you would get a very profitable crop from ash.

286. We will assume that the soil in each case is the most profitable for each species?—In that case I should prefer ash

287. By "most profitable" I mean in one case most profitable for ash and in the other case most profitable for oak under the best conditions. We ought to be a little careful in making statements like that, that oak and ash are the most profitable things to grow. What I am trying to get out is that it depends absolutely and entirely on the special conditions you have to deal with in each case?—Yes.

288. And you agree that certainly you ought not to throw ash and oak together?—This is the essential point of it. You have a certain cost of transport on timber, whether it be conifers or hard wood. The price of the hard woods delivered is considerably higher than that of coniferous timbers, so that, the cost of transport being the same, it does not make such a big proportionate deduction from the value of the hard woods on the ground as it does in the case of the lower-priced timbers; and in the case of the coniferous timbers it is as much as 90 per cent., and leaves you practically nothing for growing.

289. The difference between conifers and ash would not be so great as the difference between ash and oak?—No.

290. Therefore, I say we must not put the two together?—I think I said before that I consider ash the most profitable to grow.

291. And oak probably not one-fifth or one-sixth as profitable as ash because it takes such a long time to mature?—Yes, it does take a long time to grow.

292. With regard to shake, have you had any experience whether shake in oak occurs more frequently in open woods than it does in dense woods?—I should not like to make a definite statement with regard to that. I have noticed that a band through a wood may be slightly raised or even slightly hollow, and will often contain more shaken trees than on either side. I have seen it in the case of a slightly raised part, and I have seen it in the case of a slightly lowered part.

293. On the slightly raised part it would be more?—Yes. It would be more. I have seen a band of shaken trees going through a wood for some considerable distance, and on each side it would be comparatively free. I should very much like to know more about the origin of shake.

294. You said you had had a little experience some time ago, where trees of 30 or even more cubic feet had been barked by rabbits?—Yes.

295. What kind of trees were those?—Ash.

296. (*Sir John Rolleston.*) You appear to have given some attention to ornithology. Can you tell me what effect starlings have in large numbers upon conifers?—No. Personally I have not paid very much attention to ornithology.

297. It is the habit of starlings to flock in some places, especially in small conifers of some 14 or 15 years' growth, and they completely fill the place: you do not know whether they are injurious or not?—No.

298. But you think all the birds of the air are good for forests?—Yes, they are, generally speaking.

299. They are usually all killed down except one sort?—When one sees a flock of rooks in hundreds destroying the oak moth caterpillars, one cannot help feeling that it would be disastrous to kill off those birds.

300. And weasels, and stoats, and moles ought to be preserved by the forester?—Yes.

301. On account of the mice they destroy?—Yes. One thing that foresters and owners ought to keep ever before them is that they should use the rough common timber for estate work and send the better timbers to market. I have no doubt from things I saw in Germany that the good quality of our imported foreign oak is due to selection. I saw shaken oaks in Germany, and oaks with other defects which possibly might not be sent into foreign markets. I do not know whether the Germans in that particular district do send much of any kind away, but it is important that the rougher timber such as can be used for fences and other estate purposes in this country should be used on the spot in order to keep the foreign timber bill down. Then there is the question of "extraordinary traffic." In some districts we find that a considerable amount of worry and harass has been caused to the home timber merchants owing to charges being made and proceedings being taken in order to draw damages for "extraordinary traffic." Our Federation has taken up a certain position in the matter which I should like to mention. Here is the report of our Federation for the year 1898, in which it is stated: "Complaints continue to be received from time to time as to claims by the local authorities in respect to damage to the roads by alleged extraordinary traffic in native timber, but the Section"—that is the English Timber Section—"has always advised its members to adhere to the contention that has been successfully maintained in previous years, viz., that native timber growing is a natural industry in certain districts, and therefore not liable to contribute more than the agricultural traffic to the expenses of maintaining the roads." I hold also that for a long period plantations pay rates for which they have no advantage, and that it is very hard when the time comes and the crop is realised that demands of this sort should be sprung upon them; in fact, we have found those demands if faced were not proceeded with. Still, there are cases where men have given in, and it has been a serious handicap to the trade.

302. (*Professor Schlich.*) There was a severe case in Wales the other day in which heavy sums of money had to be paid which practically came to as much as the timber was worth?—We had the same thing in Yorkshire. In cases, however, where the Federation has taken the matter up, notwithstanding the magistrate's decision, an appeal has been made and the thing has been quashed, the District Council having to pay not only the whole of the costs, but the costs incurred in the preparation of the magistrate's case.

303. (*Chairman.*) Do you try to meet the objections of urban authorities by having broader wheels for heavy loads?—That is so, and I believe in the trade generally broader wheels are used than in other traffic. Timber merchants, as far as my experience goes, do everything reasonable in a case of that kind.

304. (*Mr. Marshall.*) In the old turnpike times, timber carriages on wider wheels were allowed at a lower rate than timber carriages with narrow wheels?—I think so, and that was quite reasonable. Generally speaking, the question of transport is the most important thing for growers of timber to consider in connection with their forestry.

305. (*Chairman.*) I should like to ask one question with regard to transport. Do you think that other timber merchants like yourself have not done much work yet with traction haulage?—One hears of cases, but I have not had much conversation with anyone who has done it.

306. It is not common in England?—I do not think it is common.

307. On the other hand, the saw-pit is still used here, is it not?—Occasionally. Personally, I have saw-pits for certain work, cutting out boat timbers. I have a barge-building yard, and we find it is economical in cutting out long curved timbers to use the saw-pit.

308. Do you think that the traction engine with cars, and the travelling saw bench, and all the available apparatus for cutting up which can be sent along a road wherever you want it to go, is quite possibly a system from the extension of which you might expect certain advantages?—I think it is possible. With regard to Government assistance in the way of planting, in Germany loans are granted. There are other witnesses who may be able to speak more on that subject than I can, but there they are developing waste lands by Government loans at a low rate of interest, with Government supervision.

309. Would you require to have a Government gamekeeper also?—It is quite possible.

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310. It would want official supervision, would it not?—Yes, and working plans with very strict supervision. The supervision is perhaps of more importance than the grant. I am speaking of a thing among experts, but there is no doubt about it that a system of that kind, with Government supervision—something that cannot be altered—is one of the things we really ought to aim at.

Mr. C. Hopton.

Mr. CHARLES HOPTON, called; and Examined.

311. (*Chairman.*) I believe you are Vice-President of the Timber Trades Federation?—Yes.

312. And I think you wish to supplement Mr. Margerison's evidence on one or two points?—Yes, with regard to the rebate on foreign exports. It is the custom of the French and Belgian railways, to my knowledge, to give preferential rates for all exports. I found that there were certain rates for timber to the different ports, but if that self-same timber was to be exported, then there was a rebate on those rates given to the exporter. Of course, that is a different system from that which obtains here. Abroad they foster home products, whereas on this side we seem to penalise our home product by the railways charging higher rates. That was the only point, I think, upon which Mr. Margerison did not speak.

313. (*Mr Lewis.*) What inducement is there to the railway companies to give preferential rates? Does the Belgian Government assist the railway companies?—Some of the railways are Government railways, and assistance is given.

314. Do you know whether on railways which are not Government railways the same system of giving preferential rates to exporters prevails?—Yes, the system prevails.

315. In that case do they receive any support from the Government?—So far as the Government is concerned I do not know that they receive actual support. What I am referring to is the fact that they have lower rates for the same produce. For instance, take a rate in Belgium going from the interior to Antwerp. The rate may be 15 francs a ton to Antwerp; but upon a declaration being signed by the sender that the goods, or timber, or whatever it may be, are for export, he gets a rebate upon that rate of, say, 5 francs a ton.

316. It would appear that in regard to Government railways it is within the power of the Government to encourage export; but is that the case with reference to privately-owned railways? Is it in consequence of any encouragement that they receive from the Government that they charge preferential rates?—That I am not able to tell you. Instances have come under my notice where they had a rebate from the railway company; but whether they obtained money from the Government or not, I am not sure; but no doubt the Committee will be able to get that information.

317. You appreciate my point, and possibly you may be able to obtain that information for us?—I think the Committee could easily get the information from one of the State railways. If the Committee makes an inquiry from any of the ports whether there are any rebates on the rates for exports, it will be found that what I have said is correct. I think what I have said holds good with regard to all the French and Belgian railways. You can easily obtain that information for yourselves. You can soon find out whether it applies to both private and Government railways.

318. (*Professor Schlich.*) Have you ever received any timber from Belgium?—Yes.

319. That is worked-up timber, is it not, and not in the rough?—In the rough.

320. Timber from Belgium?—Yes, beech. Mr. Margerison has spoken of beech. We have received beech from some Belgian ports.

321. I am surprised at that statement. I have been in Belgium myself, and I know that Belgium imports timber in about the same proportion as Great Britain and Ireland. The imports of timber into Belgium amount to over one hundred million francs a year, and I should have hardly thought it was worth while for the Belgian Government to encourage export?—It is, however, a fact, and I can give you the names of the estates if you like, one of which belongs to Prince d'Aremberg.

322. (*Dr. Somerville.*) I think you said when Mr. Margerison was being examined, that beech butts were sold for piano making?—Yes, for wrest-planks.

323. But the case of the piano would be made of something else, would it not?—The cases are made out of all sorts of wood.

324. Chiefly spruce?—No, chiefly from white wood from America, which is veneered, or from mahogany. A large quantity of American white wood is used for that purpose now.

325. (*Mr. Marshall.*) Are you a timber merchant yourself?—Yes, I am.

326. Do you go in for ash?—Yes, a great deal.

327. Bent ash?—Yes. I go in for ash for bending a good deal. I may anticipate your question, and say that English ash is about the only ash that will bend.

328. Do you travel much, and go all over England to get your supplies of timber?—Yes. I find that the supply diminishes year by year, and that we have to go further afield. Unfortunately, however, the railway rates are so high that we are obliged to use foreign timber in the place of British timber. Previously, of course, we used British timber.

329. With regard to the quality. I suppose you will not admit that the American ash is anything like as good in quality as English?—It is not at all suitable for bending purposes. The only use American ash can be put to is where it can be used in straight form; but where curves are used no other ash will take the place of English.

330. When going about the country buying timber, do you see much young ash coming along?—Very little.

331. (*Chairman.*) Is there any other point you would like to mention?—I do not think so. The points which Mr. Margerison has brought before the Committee concern forestry more than anything else. The Federation can give you any amount of information as to the comparison of railway rates, English and foreign; I do not know whether that concerns the Committee. A great deal of stress appears to have been laid upon that question by one or two of the members; but, generally speaking I may state that the rates for English grown timber, as compared with foreign, are in some cases from 30 to 60 per cent. more, even taking into consideration its better form.

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Colonel FREDERICK BAILEY, R.E., Member of the Committee; Examined.

332. (*Chairman.*) I believe you have had great experience in the Forest Department in India and at Nancy before occupying your present position at Edinburgh University?—Yes.

333. Also in English, French, and Hungarian forestry; you are editor of the Transactions of the Royal Scottish Arboricultural Society, and you have had practical experience in surveying management under the British system?—Yes, that is so.

334. I believe you wish to make a statement to the Committee, and that I think will be the most convenient form of taking your evidence?—I may, perhaps, mention in connection with my experience in this matter that for 31 years I have been engaged in forestry business, the last 20 years of which have been spent in forest education. I have spent seven years of that time as director of the Indian forest school, three years at the forest school in Nancy, where I was in charge of the British students; but took the opportunity of passing myself through the courses. For the last ten years I have been lecturing on forestry in Edinburgh. That makes a total experience of 20 years in forestry education. I have also travelled a great deal and inspected forests in many parts of Europe, including most of France, a considerable portion of Germany, Hungary, and other parts of the Continent. I have also seen forests in Canada, and, to some extent, those in Cape Colony. I have published reports on the forests of France and of Hungary, and have framed working plans for two estates in Scotland.

335. Perhaps you will be good enough to read to us your statement?—I have drawn up this memorandum with the object of saving time, and I shall be glad to answer any questions which may arise upon it.

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The conviction is gaining ground amongst Scottish wood-managers that the results of the old sylvicultural methods are unsatisfactory, and that these methods are not the best that could be employed; there is a strong desire for instruction in the systems of sylviculture that are successfully practised in other countries.

Condition of Woods in Scotland.

The younger woods are for the most part growing up too thinly stocked, and often show considerable blanks, due to failure to make good death vacancies in the early stages. The sylvicultural methods now commonly practised here do not result in the production of a remunerative class of timber, and this is especially so in the case of conifers. The condition in which most of our woods are allowed to remain, and which appears to be mainly due to faulty selection of species, injudicious mixtures, damage by game, failure to fill up vacancies in early youth, over-thinning, especially in youth, and the practice of thinning out from time to time the best poles to supply orders, prevents their yielding a reasonable profit to their owners. See the Raith Working Plan (p. 11), which describes the condition of the older woods on that estate. It runs as follows: "Speaking generally, the younger woods up to the age of sixteen years, which cover an area of 573¼ acres, are fairly well stocked and in good condition; but the same cannot be said of the older woods (235¼ acres), which bear very thin and irregularly distributed crops of inferior quality. In consequence, without doubt, of too early isolation, the trees composing these thin crops are deficient in height and taper rapidly from the butt; while, owing to the unrestricted development of side branches, their timber is knotty; and, as they were given excessive growing space in their youth, they then formed unduly wide annual rings, composed mainly of soft tissue. To frame a reliable estimate of the growing stock in these irregular woods it would have been necessary to undertake an innumeration survey over their entire area, but circumstances did not appear to warrant this. Such a survey was, however, made of three plots, which were selected as being the best of their kind, and the following was the result:—1. One acre of mixed spruce (two-thirds) and Scots firs (one-third) in Bankhead, average age 50 years, contained 359 trees, yielding by quarter girth measurement, 2,455 cubic feet. 2. A similarly constituted crop of half an acre in Bairnsbridge, average age 58 years, contained at the rate of 382 trees, measuring 3,114 cubic feet to the acre. 3. An acre of mixed Scots fir (⅔) and spruce (⅓) in Bairnsbridge, average age 58 years, carried 387 trees, measuring 2,844 cubic feet. The above figures may be said to represent something like one-half of a full stock; and it is probable that the older woods, taken together, do not, on the average, contain more than from one-quarter to one-third of the timber that might be growing on them. From the above facts it is evident that these woods are not now yielding to their owner anything like the annual increment, or annual growth of new wood, which he might reasonably expect to receive from the soil on which they stand, and also that the quality of the wood produced is inferior." Woods in this condition do not yield produce that can compete with the timber to be seen in the yards of importing timber merchants, which is for the most part grown in dense woods, and the stems are thus long, straight, cylindrical, even grained, and free of knots. The timber of openly-grown hard woods of some species is no doubt more durable and more suitable for some uses; but such crops do not usually pay, and much timber of that class will always be produced in game coverts, ornamental woods and hedgerows, etc. The fact is that our woods are, generally speaking, grown and maintained rather as game preserves and for the sake of amenity than for profit on timber. And these objects will no doubt continue to prevail over large areas, though portions of most considerable wooded estates might, and probably would, be devoted to profit-earning, were the proprietors convinced that they would yield a profit; and in such portions sylvicultural considerations would necessarily guide the management.

Result of Irregularity in Working.

Irregular, haphazard working also acts very prejudicially, preventing as it does a regular out-turn of produce of even quality. The Postmaster-General has stated that he goes to foreign markets for his telegraph posts because he cannot secure a regular supply of suitable material in this country. The agent of certain Colonial railways recently, in search of sleepers, and who considered Scotch-grown pine better for his purpose than Baltic wood, was only able to secure in Scotland 5,000 out of the 100,000 sleepers that he required. All profit-earning woods should be managed under a settled plan, in the absence of which both time and money are wasted, and steady markets with fair prices cannot be secured; while at the same time it is impossible to organise labour-saving mechanical appliances, such as tramways, slides, shoots, etc., for extracting the timber from the woods. The cost of felling and moving a few trees taken here and there on an estate is always excessive, and the expense of fencing numerous small plots of ground lays an unbearable burden on land so protected. The interest taken by the owner in properly organised woods is likely to be much greater than if they are worked irregularly.

Financial Results Hitherto Attained.

If the financial results of growing woods are not now satisfactory, this is because the recognised system of management here in vogue has been faulty, and in most cases its errors have been intensified owing to sporting and æsthetic exigencies, so that the production of a profitable crop of timber has not been the only, or indeed the main, object of management. Figures resulting from such management have little or no value as a guide to what the financial results of an improved system might be. Figures relating to farms or mines exploited for purposes other than profit would not be accepted as conclusive evidence that farming and mining are unremunerative industries; and no reliance could be placed on the results obtained from a factory which required 100 able-bodied workers if the staff were reduced to 25 inefficient men, who, for my present purpose, may be taken to represent a quarter crop of ill-shaped trees growing on the ground, because these trees are the actual producers and manufacturers of wood, each tree adding a certain proportion of wood under its own bark every year. Another source of failure to realise profits is no doubt the practice, which is justified from some points of view, of leaving ground fallow for several years after it has been bared of trees. I know several estates on which the planting up of ground that has been bared of crops is many years in arrear, so that the amount of growing timber upon the ground just now is nothing like what it was, say, a dozen years ago. The revenue received from this unstocked ground is practically nothing. Our woods can produce good timber. There is no doubt whatever that under improved management we can produce just as good timber as that which we import, and that the growing of timber can here be made profitable. The general lowering of rates of interest on good securities has in this respect placed woods in a better position than they formerly occupied. It is said that our soil and climate are unsuited to the growing of woods; but this is not the opinion of the foreign experts who visited us. In their opinion our soil and climate are very favourable, and the magnificent isolated trees to be seen in parks and on roadsides prove this. No one appears to have explained what the defects of our soil and climate are; it has, however, been said that we have too little sunshine, though we probably have quite as much as is enjoyed in Norway, Sweden, Finland, and the Southern and Eastern shores of the Baltic, whence much of our imported timber comes. Here we have, unfortunately, no great State forests such as exist in Germany, France, and other countries to act as object lessons and to demonstrate the results of scientific management. We have indeed no woods that have been managed on correct lines during a period sufficiently long to show the results of such management, and we have come to believe that our woods, which are too often only half stocked with trees of rough quality, cannot produce anything better.

Model Forests Required.

We urgently require two or three model forests of limited area to be owned and managed by the State—I emphasise the use of the word State—privately owned woods are unsuited to the purpose. The objects for which these forests are required may be thus briefly stated:—

(1) As a field of practical instruction for students. Lectures without practical instruction in properly managed woods are of comparatively little use, for it is impossible to convey correct ideas regarding many of

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the most important sylvicultural processes by words and diagrams alone.

(2) To prove the results of rational methods of management in crops grown on our soil and in our climate, and to act as object lessons in sylviculture and systematic management to land owners and foresters throughout the country.

(3) To carry out investigations and experiments which cannot be undertaken on private estates, and to provide reliable data regarding the growing of woods for profit in this country. At the present time we have Dr. Schlich's admirable manual. Of course, his figures are all drawn from other countries, and what we would like to see in the course of time would be a set of similar figures drawn from woods grown on our own soil, and in our own climate.

Until the State sets the example, nothing effectual will be done by the majority of private owners; and existing doubts as to the capacity of our country to grow high class timber in paying quantities will not be allayed. The State need not be asked to grant away the sum required to purchase the model areas. It would retain ownership and receive the revenues.

With regard to the course of forestry given at the University of Edinburgh, this course has been maintained continuously for the past twelve years. It has done much to arouse interest in the subject, and to spread rational notions regarding it. The course was attended during the past Session, 1901-2, by nine students; the number during the preceding Session was ten. Excluding the Session of 1891-2, when fees were not charged and forty students attended, the total number of students during the past ten years has been 76, the yearly average having been 7·6. During the past Session the work of the class was arranged as follows:—

Class-room work.	*Meetings.*
Introductory lecture	1
Principles of Sylviculture (Text Book, Dr. Schlich's, Vol. 1)	17
Formation and Tending of Woods (Text Book, Dr. Schlich's, Vol. 2)	25
Protection against injuries	19
Structure, defects, and physical properties of timber	7
Utilisation of produce	12
Forest management	7
Uses and effects of forests	3

That makes 91 class-room lectures. Then I have held three examinations and taken eight excursions occupying 18 hours of actual work in the field without counting going and coming. The excursions to woods and nurseries were 5, and to timber yards, etc., 3, the total being 8; which means that the class met 102 times. It is urgently necessary to provide one or more small State model forests in connection with this class, as well as for the other reasons stated above; and it is also most desirable that, in addition to the model forests, which must unavoidably lie at some distance from Edinburgh, a forest-garden should be provided in the immediate vicinity of the town. Instruction to young working foresters would be provided by employing them in the woods, and by lectures given to them there. In most cases they would be unable to attend the university class. The salaries paid to foresters are now low, but they would certainly improve were a commencement made to manage woods on business lines with a view to profit. The claims of Scotland in the matter of model State forests are undeniable, not only on account of the educational efforts she has made in the past, but in view of the large area of her existing woodlands, and the number of persons actually engaged in forest work, as well as of the vast extent of her waste lands which await afforestation.

Lectures for the Aberdeenshire County Council.

The experiment has just been tried of giving a short course of four lectures, arranged by the County Committee on Secondary Education. The lectures were delivered in the schoolhouse at Torphins, and there was an average attendance of from 40 to 60 persons. It is, of course, difficult in a country district to secure the attendance of the people to whom instruction in forestry would be most valuable; and this difficulty would be enhanced were the course extended to a really useful length. Such short series of lectures, however, do good by arousing an interest in the subject, and by inducing persons who, as owners or foresters, are engaged in the management of woods to seek further instruction.

Extension of the Wooded Area.

Vast areas of waste land in Scotland might be planted, without including ground in excessively exposed situations, or where the soil is very shallow or dry. Conifers will grow on soil which is very poor. The most important extensions might be anticipated in the Highlands, where they would have an important influence on the rural labour question. Every 1,000 acres of added forest would provide work for about 16 men, representing a population of 80 persons, without taking account of those employed in the transport of produce, and in the various industries which regularly managed woodlands generally give rise to. Apart from their value as producers of timber, woods have great value as providing shelter for farm crops and stock; and, when grown on water-gathering areas, in securing the water supply of towns.

Timber Supply from Abroad.

Mr. John Mitchell, Timber Merchant, Leith, recently showed in his yard a batch of American logs which arrived at the port of shipment by rail. They had been cut to suit the length of the trucks. He said that this was the first batch he had seen which had been so conveyed. This tends to show that the forests conveniently situated for water transport are, in some localities at any rate, becoming exhausted, and that ground more remotely situated is beginning to be drawn upon. Mr. Mitchell said that 30 years ago his firm got from abroad, without difficulty, anything they wanted; 20 years ago even they could do this, though the prices paid were then considerably higher, but now the old class of timber cannot be got even at double the old rates.

336. We are very much obliged to you for your statement. You feel that there is a general opinion amongst all classes connected with forestry in favour of a better system of training?—When I first came to Edinburgh about ten years ago there was a good deal of prejudice felt about this matter. The foresters were sensitive at the suggestion being made that it was possible to do anything better than they were doing; but I have certainly found that with the lapse of time that feeling has almost entirely, or perhaps entirely, given way, and now I am quite sure I am correct in saying that there is a general feeling of acquiescence in the views I have stated in regard to the inadequacy and insufficiency of the present system, and also a great desire on the part of a large number of men—and it is not confined to the youngest men—to learn something more. I know several working foresters who are most anxious to learn, men who have been 20 or 30 years at their business.

337. I believe some of the leading foresters in Scotland have always felt the want of some provision for training?—Yes.

338. I remember the Select Committee of 1887 when Mr. Macgregor was examined. He was asked by Dr. Farquharson whether he would have done better if he had had a course of scientific instruction, and he replied that he had not the slightest doubt of it, and that he had felt the want of it all his life; and that I think has been the feeling of the more intelligent foresters?—Yes; it is now definitely centred on a desire to learn what are generally called "continental" methods.

339. You think that two or three State forests under separate executive officers are required?—Yes, I think so.

340. But supposing we had to begin with one, is there any particular centre you would suggest?—Do you mean one for the whole of Great Britain?

341. Yes, to begin with?—I feel great interest of course in Edinburgh.

342. I mean one State forest in connection with a central system of forestry education. In the questions and answers that passed between a witness and the Committee this morning some distinction was drawn between centralising the higher form of forestry instruction and de-centralising the instruction for the working foresters. My question is: Supposing that the State undertook to create one State forest in connection with some centre of forestry instruction, either a forest school or a university, your answer would be as you have given it?—That is what I think. I consider Edinburgh is a very suitable place, because there is such a large amount of woodland in Scotland; it is nearer to

woods, and to woods of more varied character than any other centre of instruction could be. With regard to the question you have mentioned, of carrying on instruction at some centre, which might be a University or a separate forest school, that is a very big matter. If you are going to have a separate forest school for the higher education of foresters, you will require a very large equipment for the purpose of carrying that on. I speak from recollection, but I think I have given Mr. Hooker some figures from Nancy where there are something like 14 or 15 professors, and in most forest schools they have a very large number of them when they teach the whole thing from the beginning, including what we call the auxiliary sciences, such as chemistry, botany, geology, and so forth. These are all taught by special professors at the large forest schools. But if you can go to a university where professorships already exist in these subjects, and where the students can avail themselves, at least to some extent, of the existing instruction, that makes things easier. It must be fully admitted at the same time that the instruction they get from such professors is not necessarily chosen in their particular interest. I mean if you have a separate forest school you teach forest botany instead of general botany, and so with all the other sciences; there is no special direction towards the subject of forestry given in the general classes at a university. That is a matter of course, and is evidently a drawback. Still, I think I have never seen my way in the existing condition of things, with the badly paid places which are available at present for foresters, to propose that a separate forest school should be started. I believe we should have to begin, in the beginning at any rate, with organising instruction in forestry at some existing institution, some university, in fact.

343. One forest school would serve as a centre for practical instruction for more than one University or set of classes?—Yes, one area.

344. One area of State forest would serve for several centres of instruction?—It would depend upon where it was placed, of course, and what the distances were. With regard to one area or more it would, of course, be very desirable to have model areas on different classes of land. For instance, you have the high-level grounds of the Highlands for conifers and the low-level grounds for the growing of hard woods, such as oaks, ashes, or so forth. You would not grow these all in the same place, and for that reason alone you require to have more than one area.

345. There is a distinction between a State forest and the forest garden?—Yes, that is quite a different thing.

346. You would have to have a forest garden attached to each centre of theoretical instruction?—That is so. You want a forest garden. It is simply a garden of young plants which could be kept only for a few years, except perhaps a few isolated trees which might be allowed to grow up; but you could never have all sylvicultural operations illustrated; it would be impossible to do that in a forest garden.

347. A forest garden would include experiments showing the results of different methods of planting?—It would, but most of such work could be very much better done in the forest.

348. The point I wish to make clear is that supposing the State were to begin by creating one State forest, would it be possible, by having forest gardens attached to different centres of instruction, to carry on your experimental work in connection with the different University classes, with at the same time a State forest which would be valuable for all these different centres?—Experiments could be carried on only to a limited extent in anything which might be called a forest garden.

349. You attach more importance to the higher education of the agents and head foresters and landowners than you do to that of the working foresters?—In the first instance it appears to me that what you want to do certainly is to educate the landowner and the agent, because if you educate the forester ever so highly, the landowner holds the purse-strings and has absolute power in the matter, and perhaps will not do anything. The forester can then do nothing, be he ever so well-trained; but when once the master is convinced of the desirability of doing the thing, and sees how it ought to be done, then perhaps he will begin to do it. If you put the highly-trained forester under a proprietor who knows nothing about the business, it is not likely that he could do any good.

350. You cited the opinions of eminent foreign authorities, such as M. Boppe, Herr Schwappach, and others in the paper which you wrote for the Royal Scottish Arboricultural Society which was presented to Mr. Long?—That paper contains some allusions to their opinions.

351. With which, of course, you concur?—Yes.

352. In it I see you give the waste land, and according to your figures the total area of mountain and heathland used for grazing is 12½ million acres, nearly 9½ millions being in Scotland?—I took those figures from the agricultural returns.

353. You go on to say in your paper, "While out of a total additional area of nearly 9 millions of acres of unused waste land and inland water, about 4½ millions are situated in Scotland." Your opinion is that some substantial proportion of this area might be profitably utilised for timber?—Yes.

354. Do estimates vary considerably as to the amount which might be so used?—I think if you really wanted to determine how much land might possibly be afforested a special investigation would have to be made.

355. That is what you desire?—Certainly.

356. A small Commission which would have to report definitely?—Yes; I think that is the only way—a special inquiry. Much depends, you see, on the elevation of the ground, the nature of the soil, and so forth, and that could not be ascertained by simply looking at maps and marking off blank areas.

357. With regard to the state of the existing woods, you quote M. Boppe as having stated that it was "a matter of regret that amongst all the forests visited by us in our travels there is not a single one suitable for the teaching of sylviculture on that broad basis so essential when the pupils are called upon to apply it in all quarters of the globe." That is your own opinion?—That is my own opinion. I have never seen one that is now fitted for the purpose of instruction. With regard to that point, I wish to emphasise the impossibility of giving efficient instruction in a subject like forestry, which I think exceeds all other subjects I am acquainted with in this connection—that is to say, it requires practical training work more than almost any other science. You may teach some sciences by bringing objects to the lecture table or handing them round amongst the students; but the things you want to show to a class of young foresters cannot be possibly so dealt with. What you want is crops of trees; you cannot bring them to the students, you have to take the students to the trees. You therefore require a practical training ground to which students can be taken. In India there is a State school at Dehra Dun, of which I was the first Director. We had an excellent system of training, which we gave during the rainy season for three months by lectures in the house, when it was difficult or next door to impossible to go out into the woods. During the other portion of the year, about eight or nine months, we gave the lectures actually in the woods. We made sheds, or pitched tents, and the instructors, lecturers, or professors gave lectures to the men actually in the woods, and then they went and looked at the crops of trees. Or they went into the woods first, and came home and heard a lecture. That is the way to teach forestry, in my opinion. To attempt to teach it as I have been trying to in Edinburgh for the last ten years, by giving lectures and going out as often as we could to woods which have not been managed in the manner one has taught the class to manage woods, is a very inefficient way of teaching forestry. I do not say it does no good; I think it does good. I think the lectures given in Edinburgh since they were started by Dr. Somerville twelve years ago have had a very considerable effect. I believe that the 76 men who have passed through my hands and the men who passed through his hands—perhaps 100 men altogether—have sown correct ideas throughout the country, and have had a very considerable influence in modifying the prejudice that existed some years ago in regard to all methods that were not Scotch.

358. I suppose not only for the development of the resources of the mother country, but for the proper administration of our dependencies, and for the proper education of colonists, there is need to have a thorough system of forestry instruction?—I think so; not only for this country, but for the Empire generally.

359. With regard to my question as to one forest centre, Dr. Schlich says (you quote him in your article on forest education): "In my opinion you would do better if you were to start and concentrate operations

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so as to make one definite scheme a reality"?—Yes. At that time there was some talk of having lectures in various centres. It was proposed to have lectures, I think in Glasgow, in Aberdeen, and other places. We had not the organisation for them, and if we had attempted to do that we should have certainly failed. It was evidently a better policy to start with one scheme, made as good as it could be, and then if others arose as offshoots from it a very good result might be obtained; but it is certainly a great mistake to begin with scattered efforts.

360. Dr. Schlich also states: "There being no State forest in Scotland, I think the Government would not go out of its way if they were to buy an estate, a considerable portion of which is already under wood, and to affiliate it with the forest school at the University of Edinburgh with a duly qualified wood manager in residence on the spot." I suppose that is the scheme you support?—Yes, that is the scheme. Such a forest as that would form, as I stated in my memorandum, a training ground for a working foresters' class, the students of which would come there to practise and work with their hands in the woods under the direction of a skilled superintendent. Also at certain times or seasons, or certain days of the week, or however it might be arranged, they would get lectures on the theory of the business.

361. You say that the model forests would presumably be under the Board of Agriculture?—Yes, that is what I propose.

362. In your own scheme you provide for the acquisition of the land and trees required for conversion into a model forest 1,500 to 2,000 acres of suitable land within reach of Edinburgh, and including some 500 acres of growing woods averaging 40 years of age, and you estimate that that would not exceed in cost £40,000?—Yes.

363. You consider that the net annual income from such an estate would not be less than £1,000, and might be as high as £1,500; and this with an annual grant of £500 from Government you say should be sufficient to meet all the charges of maintenance? That is the scheme which you suggested?—Yes. Of course, it stands to reason that if you take over an estate, such as it would be possible for the Government to acquire, an estate which has been over-worked for example, as a great many of the estates have been, it would not be possible to get from it at once the full revenue that time would yield. There must be a period during which there might be very small revenues from it. That is the reason why certain financial aid might be required in the beginning, which would not be required later on. On most estates, owing to the irregularity with which successive owners planted, the stock is not anything like complete. Taking them as they now stand, and working out the number of trees with the various age classes, it is generally found that there is a very long blank, because the proprietors at a certain period did not plant anything. If you took over an estate so constituted, there must be a time during which the revenue would be small, but as soon as the estate became thoroughly well-managed and fully stocked, you would get a regular and ample revenue from it, I think.

364. With regard to the area of waste land, you think a considerable proportion of it might be afforested. I suppose you have no doubt that, to a considerable extent, afforestation would be a profitable undertaking?—I have no doubt about it.

365. Mr. Grant Thomson, in his evidence before the Select Committee in 1887, calculated that the plantations under his management would yield from about 7s. 6d. to 10s. a year per acre. That is in Strathspey. You believe there is a considerable amount of such land which might be expected to yield a return?—Yes, but there is plenty of land such as that now yielding a very small revenue to the proprietor. About a week ago I was in Aberdeenshire, and I went round some parts of an estate with its owner. We went over a good deal of ground which he is now planting, and which he told me was only yielding him 1s. an acre all round, and such ground is quite suitable for planting.

366. But from the want of any system of proper book-keeping for woods, and any accurate record, it is very difficult to tell exactly how timber is paying and has paid?—Yes, it is almost impossible. As I have said, even supposing there were complete figures, I should not think them of very great value, because the system of management has been bad. They would not influence me one bit in forming an opinion as to what properly managed woods might yield.

367. Did you tell us in your statement what class of students attended your lectures?—No, I have not stated that. They are all men interested in the management of land in some form or other. As you know, there is a Chair of Agriculture, and a Degree in Agriculture may be taken at the University. For this certain other subjects are optional. The subject of forestry is one of the latter, and a certain proportion of the candidates for the degree of B.Sc. in agriculture select forestry as one of their subjects, and to enable them to get the degree they come and attend my classes. Those men, I suppose, are looking out chiefly for factorships. Sometimes they are going to farm, and occasionally they are men who are going to the colonies. They are men who are interested in land in some form or other. I have also had a certain number of men who are the sons of proprietors. Several of them have been the eldest sons of proprietors who ultimately were expecting to come into properties themselves, and they have attended my classes to learn something about the management of woods. I have had a few working foresters. Within the last three or four years a bursary was established by the owner of Raith, and it has provided every year a working forester as a member of the class.

368. I observe that during the year when there was no payment of fees in your class, there was a great extension of the number of your students?—Yes. I will tell you the history of that. It was the first year I came up to Edinburgh—the year 1891-2. The course ought to have begun in October, but there was no one to give the lectures, as Dr. Somerville had left about that time. I came up early in January. A short course was put on by the University authorities, and there was a discussion about the fees. I was very anxious to have a number of students attending the class, and I thought it would be very desirable to take no fees if possible. I therefore went to the University authorities and asked them whether, under the circumstances of the short course, they would agree to charge no fees. They hesitated very much to do this at first, because they said it established a bad precedent. But ultimately they agreed, and the result was that I had actually 40 students. The next year I suggested that as it had answered so well we might charge no fees again, but the University authorities did not see their way to that, and a fee of £3 3s. was charged, with the result that I only got a quarter of the number that I had before.

369. Do you anticipate any advantage from Mr. Carnegie's benefaction?—I hope so.

370. But the non-payment of fees had an important bearing on the number of students in your class?—It had.

371. Do you think it desirable to have safeguards against the probable dearth of the world's timber supplies?—I think so, certainly. I believe Dr. Schlich will make a very full statement on that point. I have made some mention of what my friend Mr. John Mitchell, the timber merchant, told me. He is very emphatic on this point, and I have had many conversations with him about it. He will tell you there is no question that the timber supply is falling off so far as quality goes, and that prices are rising. He is a man who knows his business very thoroughly, I think, and takes a great interest in it; he has told me of matters within his own recollection, and there is no doubt the imported timber is now of a comparatively inferior kind. You have only to go into his yard or any other of the yards I know about Edinburgh to see this for yourself. You will find an immense quantity of the timber is cut from small trees. Large quantities of it consist of trees cut in halves through the pith or thereabouts, and the slab just taken off the top. There you get a waney piece. But I have asked Mr. Mitchell whether that was the sort of stuff he used to get 30 or 40 years ago, and he said that it was not; that it was then not thought worth while to bring it over, but that now very little else is sent to this country. I mentioned also the case of the railway-borne or land-borne logs that he got over, of which Mr. Mitchell showed me some samples the other day. He said: "This is the first batch of logs we have had in our yard which have evidently been carried by rail, and it is a new thing."

372. While substitutes are no doubt frequently found for timber in regard to certain purposes, yet there is always some fresh demand arising for timber?—Yes, the use of timber in the world is greatly increasing.

I have no doubt. In connection with the supply from abroad, I may perhaps mention a visit that I paid three or four years ago to Canada, when I went across the continent from the Atlantic to the Pacific. It was a dismal sight when passing through that splendid country to see the destruction that had been wrought by burning. They have some kind of nominal organisation, but the practical result is that the timber is burnt off the face of the earth. You can go by train on the Canadian Pacific Railway, and day after day you will go through nothing but burnt poles. This was caused in the beginning by the contractors setting fire to the forest for the purpose of clearing a way for the railway, and by the settlers in the backwoods for the purpose of clearing their settlements. They had a tract of land given to them which was burdened or cumbered with fine timber. The timber was of no advantage to the settler, and he did not want it. What he desired was an open space in which to grow agricultural crops, potatoes, corn, and so forth, upon which to feed his family; but when he found the ground encumbered with great trees he had to clear them off, and the simplest way to do it was to put a match to it and fire them, which he promptly did. The fire spreads far and wide. As all the settlers were doing the same there was, of course, a great deal of burning. When they desired to put the fire out they found that they could not. When the ground has once been burnt over the health of the trees that may not have been actually killed is very much affected; they all become drier, and the next time a fire comes along it burns them clean off. I have been a little in the United States, but not enough to speak very fully about the state of things there, but I believe exactly the same thing is happening over a large proportion of the United States.

373. Do you think that in this country some further precautions ought to be taken against fires?—Most certainly I think they should. I am happy to see that they have invented a smoke box or some other apparatus for preventing fires caused by the sparks from engines. I am afraid there is a great deal of damage done in this country by fires which are avoidable. To begin with, proprietors ought not to plant young conifer woods right up to the edge of the railway. Why should not they put a strip of hard woods which are less inflammable along the edge of the railways for protection? It is only common-sense to take such precautions as that. We never think of taking any precautions at all, but plant inflammable trees up to the very fences of the railways, and then cry out when they are burnt. I think the same thing might be done with regard to the damage by wind. A great deal of damage has been done by wind, though a large part of it has been unavoidable. When you get such tremendous gales as occurred during the year of the Tay Bridge disaster—in 1893 and 1894—no doubt damage could not be entirely avoided, but at the same time my experience is that gales of that sort do not pass over the whole country, but run rather in narrow channels, doing damage in strips. If a certain strip of country must suffer there is no reason why the whole country should suffer from moderate gales as it now does simply because no precautions of any sort are taken. The kind of precaution I allude to is the growing of protection belts of well-rooted trees especially trained to withstand winds on the outsides of forests, and along roads and rides; also on other parts of large extents of land where you require to duplicate or triplicate the lines of defence. Again, in felling woods, where a part of the wood is taken, it is the practice to cut the outer trees along with the rest, and I think that is quite wrong. The outer trees should be either never cut at all or should be left until the whole of the other cutting is done. If those trees have stood during the years that it has taken them to grow to their present size, they will probably stand during the rest of the period in which the wood is being cut down. I should wish to have the outside trees of all woods on every side, unless such woods were particularly sheltered, maintained for the express purpose of protecting the trees that grow within, and I should not advocate felling them at all. Let the trees, when they become old and ragged, be replaced by others planted to fill up the gaps.

374. I have just one other question dealing with æsthetic considerations. Many people seemed alarmed at the prospect of the introduction of what is known as commercial forests into this country. Are not many of the French, German, or Hungarian forest along the Vosges, the Rhine, the Carpathians, or the Danube, as beautiful as the ordinary average British wood?—I suppose all matters of beauty are matter of taste. To my mind they are more beautiful, and that certainly was M. Boppe's idea. I have heard a good deal said about this subject, and I think a great deal of what one hears is said by people who have never seen well managed woods, and who picture to themselves something very unsightly. I do not see anything unsightly in them myself. If you had an area of 800 acres of Scots pine on a rotation of 80 years system, you would have plots of 10 acres or thereabouts, each plot differing in age one from another. Those plots would not be all arranged in a row, but would probably be situated in two or more different parts of the estate. There is by no means a complete sameness and monotony in such a crop as that. Some of the crops would be old and just coming to the axe, while some would be middle-aged, some young, and others just springing up. In fact, there would be all gradations. You would have beechwoods, ash woods, oak woods, and I think there would be a very great variety about them. It is quite an error to say that such woods are not beautiful.

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375. (*Dr. Somerville.*) Following up the particular point you are on now, I suppose it is a fact, is it not, that the most popular health resorts on the continent are well supplied with forests in the neighbourhood?—As far as my knowledge goes they are.

376. Such resorts as Homburg, Wiesbaden, and others?—Yes.

377. The health resorts on the continent which are resorted to by English people and others evidently prove quite as attractive as our English forests?—I think they are very much more so.

378. They go there, in fact, in place of going, for example, to the New Forest, and apparently it is altogether a mistake, is it not, to imagine that enjoyment is not derived from a sojourn in the neighbourhood of such forests?—Absolutely so. I would go one step further and say that even supposing that a proprietor desired particularly that a part of his woods should remain in a particular condition, that does not oblige him to keep the whole of his woods in that state. For instance, if he wished to have a lengthy carriage drive leading up to his house kept in the wild condition in which he has seen it from his childhood upwards, there is no reason why he should not mark off a strip on either side of the road and do what would be much better from a commercial point of view inside that limit.

379. You mentioned that it is a common practice in Scotland, and I suppose also in England, to leave land unstocked for some years after the wood is felled. I suppose you do not find that prevails under a scientific system of sylviculture to the same extent on the continent?—It certainly should not. When I first went to Scotland I was a great deal puzzled by the practice of leaving the ground bare for four or five years. I looked at "Brown's Forestry" to find out whether he said anything about it, and I found he simply said it ought to be so left, but did not say why. I afterwards came to believe that it was on account of the attack of the weevil, which no doubt is a very serious drawback, and does a great deal of damage to young plantations. I have no doubt therefore that it is to let the weevil die out from the stocks of the trees that the ground is left blank. Whether that is the best way to deal with the difficulty is another matter; I am not by any means convinced that it is. I think it would be better indeed to face the weevil in some other way, and not to lose four or five years' growth on the ground. What I was alluding to when I said the ground was not planted up was rather that tracts of land are left longer than is necessary to destroy the weevil; tracts of land are sometimes left eight or ten years without anything growing upon them. There is a very great loss from this system, because not only is the land producing nothing all the time—and in any calculation of the annual produce that it yields in the future the lost time has to enter into the divisor—but also because the soil gets in the meantime covered over with an impenetrable jungle of bramble, broom, bracken, and things of that sort, which render the re-stocking of it by planting and sowing difficult and very costly on account of the number of death vacancies that have to be filled up. If the ground could be re-stocked immediately after the crop has been taken off, this would be far cheaper and far more profitable. There is another point which your question suggests to me, and that is with regard to the filling up of vacancies. It is a common practice in many parts of Scotland to plant a wood at so much an acre; it is probably planted by contract. That having been done it is left, under the idea that all that is necessary has been done to it, and that it may take care of itself; whereas it

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is a fact that for the first three to five years of the life of a young plantation it requires constant care and constant replenishment of vacancies. If during the first four or five years all vacancies are filled up as they occur, after that it may be left to take care of itself for a considerable number of years. But if this is not done the result is that you have to spend far more money ultimately than you would have spent if you had filled up at the proper time, and you get a crop of young wood—many of which I have seen—of 8, 10, 12, to 15 years of age with blanks unfilled up, and the trees around those blanks branching out, and of such a shape that they will never be any good. These crops have got past the time at which it is possible to fill them up with almost anything.

380. I suppose you would say that not only are these unstocked areas earning no increment, but the trees in the neighbourhood are positively suffering also from proximity to them on account of the way in which they are induced to become too branchy?—I was not alluding to that exactly; I mean the vacancies within the area that is stocked.

381. You not only get no returns from the unstocked area, but the trees in the immediate neighbourhood are not producing as good timber as they otherwise would do?—No, not as they would do if all were kept up to the mark from the beginning.

382. You said that what you thought would meet the requirements of forestry education in Edinburgh would be a model forest at some distance from the town, and a forest garden in the more immediate neighbourhood?—Yes; I said that I was afraid a model forest could not be got in the immediate neighbourhood of the town. If it could be, of course I should prefer it there.

383. May I ask what you mean exactly by a forest garden?—I mean a nursery into which students might be taken to look at young plants, and from which supplies of them might be drawn for the lecture table, and so on.

384. Somewhat of a mixture of arboretum and a forest nursery?—You could teach them planting and sowing there, for example, and certain other operations could be also taught.

385. Do you think some portion of the model forest area could be worked upon the lines of a forest garden—that is to say, 10, 12, or 20 acres should be divided into 10, 12, or 20 plots of an acre apiece, and that the small areas should be used for demonstration purposes to show what is meant by this, that, and the other system of sylviculture?—I think that is a very good plan—to mark off plots of moderate size, half an acre or so, for the purpose of illustrating certain operations and showing the results of certain mixtures, and that kind of thing.

386. I suppose in lecturing to your students you experience a difficulty in getting them clearly to understand what is meant by these technical terms you employ? When you speak of under-planting, the two-storied system, and selection wood system, and so on, I suppose what you find is the want of some place that you can go to and say to students, "Now, then, there is an example of this particular system I have been giving you instruction upon." There is nothing of that kind available I suppose now?—There is nothing available. In regard to the question of underplanting, the difficulty is to make students understand the degree of density that the over-wood ought to have before you can attempt to put under it some other species, bearing a certain amount of shade more or less; and also largely in regard to the question of thinning. It is wholly impossible to convey to the students by mere speaking correct ideas on the subject of thinning.

387. You mentioned a short course of instruction in forestry being carried through in Aberdeenshire; by whom was that course carried through?—The lectures were delivered by myself.

388. Was the County Council associated with the work?—The County Council invited me to do it. The clerk of the County Committee on Secondary Education asked me if I would undertake it. I drew up the syllabus which I hold in my hand; they made the schoolhouse at Torphins available for me, and I lectured there on four nights.

389. Do you mean in four successive weeks?—There were four lectures, two on successive nights and two on other nights, and the subject created a great amount of interest. I have brought the newspaper with me that gives about a column of a report, including the speech made by the chairman, and there is a leading article also.

390. I suppose you agree with me that it must be a very long time before our ideas of forestry education can be completely realised? Do not you think for the present that it would be rather an advantage if this short course idea of yours were developed, and in place of having four-lecture courses, perhaps there might be one lecture per week for 20 weeks on end, namely, the whole winter session from October to March?—That would be a matter of local convenience.

391. Do not you think that would get at a very considerable number of young foresters who will be at present altogether untouched?—I should think it might. I have had no experience on the matter except in this one case.

392. But this experience as far as it went was successful, was not it?—It was successful, although I am not perfectly clear as to whom my audience consisted of. I think a very small proportion of the people who came to hear me were engaged in the business of forestry; but no doubt the lectures did some good by creating an interest in the subject, and perhaps in getting people to inquire a little further into it.

393. You have already said that the climate of Scotland was well adapted for the growth of trees?—Certainly.

394. There is an impression prevailing in this country that our climate or soil or something else does not suit certain systems of sylviculture that are successfully produced on the Continent. For example, take the case of regeneration by means of self-sown seed. That is largely practised abroad, but very seldom practised in this country. Have you come across a case of its being successfully practised in Scotland?—I do not know that I can say that it has been systematically carried on, but Mr. Grant Thomson, of Lady Seafield's estate in Strathspey, has been regenerating his woods naturally for the last 25 or 30 years. I have been over some parts of his regenerations, and I have found them going on very satisfactorily. In Ross-shire they are beginning to do something of that kind too. It has not yet got into anything like an organised system, but it is accepted as one of the possibilities of the situation. There you find the larch and the Scotch pine are coming up very freely from natural seed and growing extremely well. One thing that has rather surprised me in connection with that is the small extent to which old heather appears to affect the young light-requiring larch and the Scotch pine; you will find in some very dense patches of heather young larches and young Scotch firs pushing their way through.

395. Mr. Grant Thomson in his evidence before the Committee that met in 1885 to 1887, said that on the Seafield estates the natural regeneration could be successfully practised. I remember that Professor Schwappach in his report said he found a success there which could not be excelled in Prussia. May we then take it that all unsuccessful regeneration on these lands is not a question of soil and climate, but is probably a question of management, or the condition to which the surface ground has attained through mismanagement generally?—What I have seen convinces me of the perfect practicability of raising young crops of larch and Scotch pine by natural means in, at any rate, some parts of Scotland. I will not go further than that.

396. (*Mr. Marshall.*) You said that the Postmaster-General could not get suitable telegraph poles in England, and so he had to go abroad for them, and I think you said some Colonial people had applied for some sleepers?—I do not think I said the Postmaster-General could not get suitable poles; he could not obtain the desired quantity regularly.

397. I am not alluding to the telegraph posts now, but to the sleepers. You say there was a large order for sleepers which could have been placed in Scotland, but that only 5,000 sleepers were available?—That was the statement which was made to me. I have a letter in my possession in which the gentleman referred to reported it to a common friend.

398. That is a most extraordinary thing, unless the sleepers were some very unusual size. The ordinary size of a sleeper is only 10 inches by 5 inches and 9 feet long. It seems almost incredible that these sleepers could not have been procured?—I cannot explain the matter. I only stated what my friend told me. I carefully studied the words of the letter, and I quoted them as nearly as

possible. But I must say that the idea struck me when reading it that he may have been arranging for a 100,000 a year for some time, and it is possible that is what he meant, and that he could not secure a regular yearly supply. It might have been that. I was not quite sure myself when I read it.

399. Then you very kindly told us about the trees used for shelter. What, in your opinion, are the best trees that one could plant, the best conifers for the outside of a plantation to provide shelter?—Very much would depend upon the locality, but there are certain trees that are particularly good in high levels. I think the mountain pine is as good as any. The Austrian pine and the Corsican pine are also good trees. The silver fir is very strong rooted and able to stand against winds. It depends on what you are wanting the shelter against, whether it is against cold winds or strong winds.

400. And it also depends a great deal on the growth of the plant?—Yes.

401. For instance, if you put up a kind of Corsican pine at the same age as the Scotch fir to protect them, the Scotch fir would go ahead so much faster that the Corsican pine would not protect them at all?—Yes.

402. I have always heard that you cannot plant a better shelter tree than the Austrian pine; is that your experience?—I think it is a very good tree for the purpose.

403. In your long experience in Scotland, have you studied the subject of rates at all on woodlands?—I confess I have not.

404. And the question of labour also. In your experience is there an abundance of labour for all forestry operations there?—I do not think I have heard of any shortage. I have not heard of any difficulty in getting the amount of labour necessary.

405. Are not the wages paid rather higher than they are in England? Does not an ordinary man in the woods in Scotland make his 18s. or £1 a week as against the ordinary agricultural labourer in Essex or Suffolk who only gets 8s. to 12s. a week?—I think you are right in that.

406. You say you have not gone into the question of rates, but I have been led to believe by reading up the evidence that the rates on woodlands in Scotland are very light indeed compared with the rates on woodlands in England, and I was wondering whether we could do something to encourage the planting of woods in England if we could get relieved of thes rates altogether or get some reductions, and also by a reduction of the death duties. Have you considered anything about death duties at all?—I know they are a great difficulty in the way of planting.

407. Have you had experience of that?—Certainly, I have heard it said.

408. (*Sir John Rolleston.*) You said there were indications that the forests of the world are being depleted?—I think so.

409. And an inferior timber is coming into this country now?—That is what I believe.

410. I suppose we can only look to certain parts of the world, not the whole world, for the timber supply, the temperate zone only?—Yes. We have not yet attempted to bring wood from the tropics. Of course we do bring some woods, such as mahoganies and special woods of that kind from tropical countries, but as a rule the conifers come from the temperate regions I think Dr. Schlich has stated that we get 87 per cent. of conifers from the temperate regions.

411. The forests of India, with which you are acquainted, are of no use for the supply of timber to this country, are they?—No, except for special kinds, such as furniture timbers and teak.

412. Nor would the large central forests of Africa be available?—I do not think so for our purposes.

413. Therefore it is only the woods of the temperate zone that we have to look to?—I think so.

414. That seems to illustrate your argument that timber planting in this country would be profitable?—Yes.

415. Is there any way of making trustees realise that? So much of the land in this country is in the hands of trustees, and nothing will persuade a trustee to plant trees?—That is my experience, too.

416. Is there any way in which we can make the planting of trees attractive to trustees?—I should say that if you began by having a model forest, which would show the profits derivable from a properly constituted wood, you might induce them to look at it. So long as the popular opinion is what it is I do not think trustees can be expected to go in for sylviculture.

417. The way to excite interest in it is to establish model forests in your opinion?—I do not see any other way. I want to show the people what can be done. What I would like would be to induce as many large proprietors as possible to go abroad and see what is done in Germany, France, and other countries. You cannot take the ordinary forester there so easily, but the proprietors themselves, who probably travel a good deal, might easily—or some of them at least—go in a properly organised expedition of discovery and see what is to be seen. I think if they did that it would go a long way to induce them to take the matter up, but there will always remain doubt in their minds that what they saw done there could not be done here, and I wish to have that demonstrated. I do not see how you can expect any private proprietor to undertake what we require. I am sure no proprietor will, and we shall have to rely upon the State to give the lead. Again, it must be said that it takes a great many years to show the results of the proper working of a forest, and owing to changes of ownership from death or sale and changes of management, and seeing that the proprietor up to the present time has complete power over his estate, there is no certainty that the woods on it will be managed for the necessary length of time on a regular system. It is on a State area only that a model forest can be established.

418. (*Professor Schlich.*) I should like to ask a question or two with regard to the arrangements for education, more particularly with reference to Scotland, in which you are specially interested. We have heard something about a forest garden and a model forest, and I should like to know whether you agree with me that the forest garden, unless it is of enormous size, can be used chiefly only for two things: first to show how to grow plants as a sort of school nursery, to show how they are transplanted and treated when they are quite young; and, secondly, for the study of forest botany in the arboretum. Do you think that a forest garden, unless of enormous size, could be useful for any other purpose?—For no other purposes than those. It is very important, speaking for Edinburgh, that we should have there a place of that sort. We have no place where you can go and get plants and show the students how to put them in, or the kinds of plants produced in this way or in that way.

419. I start from that. I start with the assumption that we have a forest garden, and what you call a model forest. I may just as well say that I think a model forest is a rather unfortunate term. I should call it a school forest?—Yes; it may be better to call it a school forest.

420. I will use the word school forest, as it suits my ideas a little better. In the case of a school forest, would you prefer a blank area to start with, or a place more or less already under wood?—The latter, under wood.

421. I quite agree with you in that. In this school forest we could teach a certain number of systems or methods of treatment, as Dr. Somerville has already mentioned, but of course there are limits to that. You may have an area for a school forest in one place which might not be suitable for all the different methods of treatment which it is important to teach. Under these circumstances ought we to stop simply at one school forest? We could not very well have two, three, or four school forests, because it would not be financially possible; but do you not think we ought to interest landed proprietors a little more so that they would lend their forests to be used for the instruction of the students in addition to a school forest: would not that be an important thing? We have an excellent example of that in our worthy Chairman, but I should like to see not only one but a dozen or two dozen landed proprietors in Scotland put their shoulders to the wheel, and offer assistance?—What do you mean exactly by "lending?"

422. Allowing the use of the forests for instruction?—Who would manage them?

423. I will go a little further. I know an instance in the Austrian Empire, in Bohemia, and Moravia. There the landed proprietors met together, and established a forest school of their own at

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their own expense, each contributing so much. They thus established a forest school to train the forest officers for their estates, and all the estates were available for the instruction of students under the guidance of the professor of the forest school. Would it not be possible to start something of that sort in Scotland?—I think it would be most desirable if it could be done, but the great obstacle to starting it is that the proprietors in Scotland have not the same advantage that those proprietors have whom you speak of. They have State forests, which they have all seen and know about, and the consequence is that they are fully impressed at the commencement with the capability of their ground for growing woods, and with the desirability of imparting instruction to their subordinates who manage them. Our proprietors, speaking of them as a body, are not convinced of that yet, and therefore I do not think they would be likely to come forward in the same way that the Austrian proprietors did.

424. We have convinced our worthy Chairman; why should not we convince a great many others?—It would be an excellent thing to do so.

425. I will leave that for the present, and come to another point. In this school forest of course all the forestry operations as far as the locality permits will be shown?—Yes.

426. You have told us that students who attended your lectures consisted partly of the sons of proprietors, men who were preparing to become factors or agents, managers or farmers, and also a few foresters—do not you think it was a mixed crew?—Very.

427. Do not you think we ought to make a little division there?—That I have proposed already to do, because I said I should teach the working foresters in the forest, that they should be taken on as apprentices, and employed actually working with their hands in planting, and in other forest operations, and then at certain times of the year, or certain days of the week, however it might be arranged, they should have lectures given them in the theory of the business. Of course at the present time we have no such place, and if we do get hold of a working forester we are obliged to teach him in the only place there is for him to go to.

428. What I am driving at is this, and I see you agree with me—to arrange a course of instruction at Edinburgh University for rather a higher class?—Certainly.

429. And have in your school forests an absolutely competent manager?—Certainly.

430. To whom your apprentices would go and with whom they would work?—Yes.

431. You must have a man who can give the ordinary current instruction in the forests to be controlled by the principal professor who conducts the instruction at the University?—Yes.

432. As you agree with me so far I will now come to the next point?—I am quite in agreement with you so far.

433. Do you not think we ought to go in for the establishment of a Faculty of Rural Economy at the University of Edinburgh, say for agriculture and forestry combined, not to have forestry as an appendix to agriculture, but to let them stand alongside of each other. Let one man who wishes principally to devote himself to agriculture take forestry as his second subject, and let another man who wishes to become principally a forester take forestry as his principal subject and agriculture as a second subject, so that you would provide a number of competent managers for agricultural estates and also managers for forest estates. If such a thing was done, we should probably be able to supply our clients with forest experts, and I want your idea on that point. I want really to know whether you would support such a scheme as that?—Yes, I think I would. It is a new idea to me, but I think probably it would be a very good thing. There are extramural arrangements of that kind in Edinburgh. There was an institution they called the School of Rural Economy, at which forestry and agriculture, and many other things, including dairy work, such as cheese-making, and so on, were taught. That School of Rural Economy has ceased to exist now under that name, and its place is taken by the Edinburgh and East of Scotland Agricultural College which is working on these lines. They have only recently started, and they have not yet developed anything in the line of forestry, although I believe they contemplate doing so. I may say that when the School of Rural Economy was in existence under that name they had a certain number of lectures given at the Heriot-Watt College in the evenings by myself to a class which numbered in the first year about 30. It then fell off, because I think the chief part of the students who came were men working in lawyers' offices, who wanted to get acquainted to some extent with this business, and having taught the apprentices of the day we must, of course, wait three or four years before we get a new lot.

434. That is not exactly on the line on which I am travelling?—I appreciate that, and I merely mention it to show that agriculture and forestry have been taught together in one establishment before.

435. I am told that there is an agricultural college at Cirencester where there is a course of forestry which consists of six lectures in the year. I do not think that is much. I was thinking of an establishment where we could educate all the men, not only for this country, but for the colonies, and I want to know whether it is worth while spending money upon it?—Yes, I think it would be an excellent scheme.

436. You would approve of that scheme?—I would.

437. You spoke of inferior timber. Do you mean by that timber of small dimensions?—That is what Mr. Mitchell told me.

438. Do you happen to know where that timber came from?—Yes.

439. Was it Baltic timber?—It is imported timber. He gets it from the Baltic and from Finland, and all about there, Norway, Sweden, and all the North of Europe. He also gets a considerable amount from Canada, pitch pine, yellow pine, butter-nut, and other sorts of wood.

440. You do not know exactly where it came from?—No, but I could easily tell you that later on. I cannot remember where the timber was obtained, but I think I am safe in saying that the timber I have seen there of small dimensions came from all these places I have mentioned, some from each.

441. (*Mr. J. H. Lewis.*) A change in the quality of timber indicated that the supply was diminishing at its sources?—Yes; what usually happens is this: When exploiters, traders, go to a place, they take the finest trees at first, and then they go further and further, taking always the largest trees. After they have got a certain distance it becomes difficult to transport the trees over such distances, and then they go back and start again, and take a second quality, and then a third quality, and so on until they have cleared the whole crop out.

442. The deterioration in the quality shows that the timber supplies are giving way, you think?—Yes; at any rate, those which are accessible. There may be supplies further inland. But I have read pretty steadily some of the timber journals in regard to this matter, and I have been very much struck with this fact in regard to news from the Baltic and Finland, that when you read of a great development of the trade you never see a single word about the condition of the forests in which they are getting the timber. But you hear that a new railway line has been made from such a point to such a point, opening up the mountains, and that 10,000 or 10,000,000 logs are expected. That only shows that they are going further in the process of denudation.

443. I presume that the manufacture of paper from wood pulp is operating to diminish the stocks of timber very rapidly?—Yes, especially as they require young wood for that.

444. That is really an appreciable factor?—It is a most important factor, I think. If they would limit themselves to cutting nothing but large trees, and would leave plenty of small ones, there would be very little harm done; the old ones would be replaced quickly by those of the class next below them in size.

445. You told the Committee your experience in crossing from ocean to ocean in Canada, and mentioned the hundreds of miles of blackened tree stumps caused by forest fires; can you give the Committee any information with regard to the clearances on the banks of the rivers?—No; I am afraid I cannot do that. I only made a hasty visit, and I went across by the Canadian Pacific Railway, and did not go about the country much. I

went to a place called the Algonquin Park to the west of Ottawa, where they have a million acres, which has been taken up and reserved by the Government, partly as a reserve for timber and partly as a sanctuary for wild animals.

446. Do you know to what extent planting is going on in Canada?—I cannot say. I could not give any figures. I do not think they are doing much.

447. You are, no doubt, aware of the movement in the United States for replanting?—Yes.

448. Do you think that that would to any extent affect the timber supplies as far as we are concerned?—I really could hardly answer that question. It must take a great many years at any rate before the timber which is now being planted can become available for our market. There is no question about it, I think, that in Canada they have not replanted anything approaching the quantity of ground they have denuded. I daresay Dr. Schlich, who has gone more into this question than I have, will be able to quote to us some words that have gone from my mind just now in regard to a statement made by an American statesman on this matter. He gave some figures which tended to show that they were destroying their woods hand over hand, and doing nothing to restore them. I do not, however, remember the words just now.

449. In that case, if the world's timber supply is diminishing so rapidly, it becomes for this country, which needs such a large supply of timber, a national question?—It is evidently so.

450. You have suggested, chiefly for the purpose of instruction, the acquisition of a State forest. What area would you suggest for that purpose?—You mean what minimum area do I think is of any use?

451. Yes?—That is a very difficult question. I might prefer, for instance, to have two small areas, or relatively small areas, one in the hills and the other on the low ground, to having one very considerable area in one place. It is a great advantage to have a good big area, but, on the other hand, it is also a very great advantage to have a variety of soil and situation, and I think I would have to be satisfied with the biggest thing I can get. I do not think it would be much use having a tract of less than, say, 1,000 acres, or something of that kind.

452. It would, I presume, take a very long time indeed to effect any great change as regards the amount of timber grown in this country merely by having better education in afforestation?—Evidently that is so, but we must make a beginning at some time.

453. Or by having a State forest of a thousand acres. We have heard that the difficulties of landowners have to be overcome, that trustees are unwilling to plant, that a number of landowners have not the means to plant, and that a number of landowners in any case, even if they had State loans, would probably object to burdening themselves and their land. Under circumstances of that kind, having regard to the diminution of the world's timber supply and the necessity of increasing our own resources in the future, would not you be disposed to go a little further and to suggest that the State itself should acquire waste land which could be used profitably for the purpose of producing timber?—I think it would be a most excellent thing if the State could be persuaded to do it.

454. Do you know what revenue the State derives from its forests in Hungary; you have visited Hungary, have not you?—Yes, I have; and I have a little pamphlet which gives the information you require, but I cannot give it without reference.

455. They have a very large number?—Yes.

456. They do much for education?—They have a splendid school at Selmetz Banya.

457. I will not trouble you about that?—They have a very fine forest school at Selmetz Banya, with magnificent museums and a full equipment of professors. I have visited it.

458. You mentioned that a Scottish County Council was doing some work on its own account, I think. Do you know anything about what the County Council of Northumberland has done recently?—I do not; I have not heard of their operations.

459. You have had also considerable experience in India?—Yes.

460. The Secretary of State for India a few weeks ago gave me some information as to the increase of revenue from the Indian forests. Do you happen to know whether this is on account of their cutting down the Indian forests, or better management, or what is the cause of it?—It is from the better working of the forests. It is certainly not from overcutting or diminishing capital stock. I have not the slightest doubt that the capital stock has largely increased, while at the same time the output is also increased. *Colonel F. Bailey, R.E.* 22 Apr. 1902.

461. (*Professor Campbell.*) You have told us that the timber supply of the world is rapidly diminishing, and that we ought to plant more in Great Britain; that the system which should be adopted is the continental system; that a great deal has been done, hitherto, to educate foresters and landowners in that system, and now we are in the position that we want to educate still further. All that is exceedingly interesting, and I quite agree with you; but I want to ask one or two more questions as to the method of imparting this instruction. At the Edinburgh University, of the number of students attending your classes a large proportion would be young men going back to farming, I think you said?—Yes, farming and estate management.

462. How many foresters do you think will have been turned out of that class since it started?—Purely and simply foresters—very few.

463. Do you believe that is largely due to the fact that they are not sufficiently remunerated?—Yes. I think it is wholly due to that fact.

464. I do not know whether it is a fair question to ask you, but I should like to have some idea of the remuneration given to a head forester?—You can get that information from others better than from myself.

465. I suppose a head forester would perhaps get £100 a year and a house?—Yes; it varies very much. It depends upon the size of the estate.

466. But £100 is not sufficient to induce men to go up to University classes?—Such a man cannot do it. That class of man cannot afford to refrain from earning his bread during the time he is studying.

467. Your proposal would be to reserve the University for the education of landowners and their agents, and to teach the practical forester in a forest school?—Yes, in the beginning. But I have a firm belief that after a time, when proprietors begin to realise the value of their forests, and the necessity of having them managed by skilful and highly-trained people, the salaries of wood managers and head foresters will increase to such an extent that that class of man can be trained in the University.

468. But you think a good deal could be done by teaching practical foresters in a forest school?—That is the proper way to begin, I think.

469. In addition to a forest you would have classrooms in which you would give these men lectures and instruction, and not bring them to Edinburgh at all?—Yes.

470. So that the forest school would be of more advantage to the forester than to the University student?—Yes, except that it is impossible to teach the University student now without having some place in which to give him practical instruction.

471. The model forest would act as a school to the young forester, besides giving a demonstration to the University man?—That is so.

472. Supposing you had a number of good foresters, trained men, do not you think a good deal could be done if these men were made inspectors of forests? We have in Ireland itinerant instructors in agriculture, men who go round and visit the farmer, spending a day or more with him, and going into all the business of his farm. Would not the same thing apply to foresters, a really good forester going to visit a landowner, or agent, or whoever might be in charge of the forest, small or large?—I think something might be done by having professional advice, periodically given.

473. Would it be possible, do you think, to take a forest as managed now on the English system, and, by sending periodically a skilled man, to carry on that forest on the new system? Would, say, ten or twelve or

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twenty visits per annum be sufficient?—I do not think so. It might be very useful in controlling the work of a man who has had the education necessary for a working forester in the beginning, but if that man has never seen the various operations properly carried on, I do not think any amount of casual visits by an expert to tell him to do this thing or that thing, would lead him to understand what he was told, or to do it properly.

474. That would be impracticable, you think. But suppose you had a sympathetic forester and a sympathetic agent or landowner?—It would do some good, no doubt; but it would not meet the case.

475. You would not recommend me to advise an Irish landlord to adopt that plan? Would it be injudicious?—If he could not get anything better, then he had better do that; but it would not effectively meet the difficulty.

476. You do not think it is a satisfactory method?—Not at all.

477. You think that nothing short of a complete course of technical and practical forestry would suit for a head forester?—At this point I should like to remark on the very great value of the woods on a large estate. If you were to take the woods on a large estate, such, for instance, as the Beaufort Estate, in Inverness-shire, the capital value of those woods must be something enormous and the possibilities of revenue, assuming that the area or a considerable portion of the area were managed on proper lines, would be very large and important. To have them correctly managed you evidently require a man who has been highly trained; a few visits now and then by someone to tell him what to do would not be considered enough in any other business. I think forestry requires more special teaching than anything else. It is certainly a subject on which there is no general knowledge, and, as I have often said, it requires more practical illustration than anything else that I know about.

478. But supposing the sympathetic landlord who is managing his own estate were in a position that he could call on an expert at any moment by paying a certain sum, do not you think that is sufficient?—When the expert came he would say, "This thing is not properly done, and you must do it in such and such a way!"; and when he came back six months later he would find it again not properly done, and he would have to give further instructions, which might or might not be followed, and in the meantime the management would be defective.

479. I was referring more to the planting?—Of course, planting is more mechanical, and no doubt something could be done as regards that.

480. Even assuming we get a forestry school, if we have to wait until we get our trained men I am afraid it would be a long time?—Some time, no doubt.

481. Planting should be done before that, I think?—There must be a gradual progress, no doubt. You must do the best you can until you get a full-going machine.

482. The system that Dr. Schlich has referred to, whereby you would have at the Edinburgh University, not an agricultural faculty with forestry added, but forestry on an equal footing with agriculture, would, I presume, not be permitted by the regulations of the University?—I am not aware of that. I cannot answer for the University. It does not strike me that there is anything impossible in it, but I do not know.

482*. (*Mr. Stafford Howard.*) You have a wide experience of estates in Scotland, on which there is a good deal of woodlands?—I have seen a great many.

483. In referring to the Raith Woods you said there were a certain number of old woods which were carrying only half a crop on them. Should you say that is true generally of most of the estates now?—Yes, I think it is true of most of the estates I have seen.

484. You are strongly of opinion that there is great room for improvement?—I am of opinion that there is great room for improvement, and that the present older woods are greatly understocked.

485. That is speaking generally?—Speaking generally, only a very light crop of trees, far inferior to those which might have been produced had the sylvicultural system been better.

486. You lay very great stress on the necessity for practical education in the forest as well as in the lecture-room?—I cannot insist too strongly on that.

487. What proportion of time ought a student to devote out of doors in the forest as compared with that which he spends indoors in the lecture-room?—I think that is a rather difficult question to answer. I would rather prefer to give you the actual figures of what is done in some places.

488. They are, perhaps, limited by what they can do, but my idea was what they ought to do. What do they do in India?—In India we had lectures in the lecture-room for about three months, and then there was about a month's holiday, which left about eight months for outside work. But the lectures and the outside work were concurrently carried on.

489. Carried on in the forest?—Yes.

490. That is undoubtedly the best place, to have a forest at hand if you can?—Certainly you want to have a school forest as near your door as you can get it.

491. The other question I wished to ask you was this. You said that vast areas of waste lands could be planted with great advantage to the country generally. What do you mean exactly by waste land?—I mean land now under heather or rock, and with no crop growing upon it. No doubt there are grazing lands and shooting lands which could be utilised.

492. You include grouse moors, deer forests, and grazing lands, do you?—Yes, I include all those.

493. Do you think that if they were planted they would produce more income than they produce now—do you hold out that temptation to landowners?—I certainly think in a great many cases they would give more than the average returns from grazing and shooting. I would rather put it this way. The amounts obtained from grazing and shooting are, I believe, very variable; they depend on the situation of the estate, and also on other considerations; but I am quite sure that there is a great deal of land now used either for rough grazing or for sporting purposes which under forests would yield a much better income to the proprietor. I may perhaps refer for one moment to what I said on that subject in the Raith working plan. I said "Of the 808½ acres composing the working circle, 137 acres have been under cultivation, and thus employed are capable of yielding a net annual rental of 9s. per acre." These figures were not worked out by myself, but were given to me by the factor. Or rather he and I went together over them, but he is more responsible for the figures than I am. I go on to say, "479½ acres are suitable for rough grazing, yielding a net annual revenue of 4s. per acre, while the remaining 192 acres are waste, yielding nothing if not stocked with trees. The annual average cash surplus derivable from the whole of this land, if not afforested, is slightly under 4s. per acre, which is a maximum figure." That is a case in point. I also make a similar statement in regard to the Novar woodland. I am not certain that I can easily put my hand upon it, but I think it is very much to the same effect.

494. You say that probably on every estate on which there is a large amount of this waste land, certain proportions at all events would be better planted than what they are now?—Yes. You asked me about the time spent in practical work. Reading from my report on the French forests: "Each year of study at the school, 2½ months of practical instruction, one month occupied by examinations; and there are two months of vacation." Then I go on to explain in general terms how the courses are arranged. They get 2½ months there of practical work each year. Dr. Schlich will tell you how he arranges the courses at Cooper's Hill in that connection.

495. (*Sir John Rolleston.*) Arising out of a question asked by Mr. Stafford Howard I should like to ask you whether there is any altitude above which planting is unprofitable—any contour line?—No doubt there is for each species, but it is not altogether the altitude that would determine the profitability. The desirability of planting with the view to profit at any altitude

would depend upon other circumstances; for instance the aspect, the extent to which the place was subject to cold winds, and so on.

496. But is there any part of the United Kingdom which could not be planted with some species of trees?—Certainly.

497. The top of Ben Nevis could not be planted?—No.

498. (*Chairman.*) I suppose it would be a safe thing to say that the existing area under timber in this country might be easily doubled or trebled?—Yes, much more than that.

499. You think much more than that?—Yes.

500. (*Professor Campbell.*) In connection with planting, you mentioned some land on which heather was growing; was that peat or bog land? Is peat land suitable?—Yes, peat land can grow pretty good trees of a certain kind. Of course it depends altogether on the depth of the peat, the drainage, and so on.

501. You do not know the bogs of Ireland, do you?—I have not been there yet. Dr. Schlich will tell you all about that.

502. (*Chairman.*) There is one little matter which I should like to clear up in my own mind. What is the difference between a model forest and a State forest?—A State forest is a forest owned by the State, whether for a school, model, or other purpose.

503. What do you consider your scheme to be?—I have called it a model forest, and Dr. Schlich has called it a school forest. It altogether depends on the object you have mainly in your mind. I have stated somewhere the objects for which State forests are wanted. The first one that came into my mind was the practical teaching of my own students. For that purpose it is evidently a school forest; but I wanted the State forest for another purpose, as an object lesson to proprietors, that they might be induced, by seeing what could be done, to try on their own estates something of the same sort; that is a model forest; if you like. So that really its name depends on the particular object you have in your mind at the moment. I have no doubt the more correct title is school forest, and I shall be very happy to call it so in future.

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504. You do not think that private enterprise will very rapidly cover all the waste lands that are available for timber culture in this country?—I do not.

505. And you would look in part, no doubt, to the result of the establishment of a school forest, or model forest, for the training of the foresters, as one of the means by which ultimately the operations of the State might be facilitated in undertaking work of that kind?—That would be so. What I feel is that few people have done anything at all towards developing this industry I feel that nothing will be done until the State makes a start. My own fixed belief is that if the State did make a start others would soon follow its example.

506. It would be important, would it not, to choose a site where you could have the greatest possible number of demonstrations, whether in growing timber, transport of timber, or utilisation of timber?—Yes, every branch of forestry must be carried on in the best possible way there, and under the most varied circumstances; that is what you want. So that everybody who came could find out something which would fit his own estate.

507. As to the forest garden, would you have a forest garden of 150 acres, showing, it might be, two or three acre plots?—I should not call that a forest garden at all. I think what you want is a comparatively small place near to your lecture-room, in which you can do exactly what Dr. Schlich indicated, namely, get specimens of young plants, teach sowing and planting, and illustrate many lectures by being able to walk into the garden and bring in things from it. That is what you want. When it comes to anything like sylviculture, that had better be dealt with in the forests. I see, on referring to my working plan of Novar, that in regard to the 4,000 acres there, with which the working plan dealt, it is said that if those 4,000 acres of land were not occupied by woods they could not be expected to yield on an average more than 3s. 6d. per acre from grazing and shooting. That is Mr. Meiklejohn's statement.

SECOND DAY.

Wednesday, 23rd April, 1902.

PRESENT:

Mr. MUNRO-FERGUSON, M.P. (*Chairman*).

Sir JOHN F. L. ROLLESTON, M.P.
Mr EDWARD STAFFORD HOWARD, C.B.
Professor W. SCHLICH, C.I.E., F.R.S.
Colonel FREDERICK BAILEY, R.E.
Professor JOHN R. CAMPBELL, B.SC.
Mr. JOHN HERBERT LEWIS, M.P.
Mr. GEORGE MARSHALL.
Dr. WILLIAM SOMERVILLE.

Mr. REGINALD H. HOOKER, *Secretary*.

The Earl of SELBORNE, called; and Examined.

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508. (*Chairman.*) You put your woods under a forest plan drafted by Mr. Nisbet: I think it would be a matter of great interest to the Committee if you would kindly tell us the reasons that led you to adopt that course?—I only took to forestry about ten years ago, and I became very keen on it. I very soon became convinced that nobody in my neighbourhood or on the estate knew anything whatever about it, and it gradually dawned upon me that that applied not only to my father's property, but all the surrounding properties. Then I turned to the best hand books I could find, and read a great number of them, and I eventually read descriptions of the German system, and then I passed on to read Mr. Nisbet's book. I got into communication with Mr. Nisbet through his publisher, and discussed with him whether it would be possible, *mutatis mutandis*, to apply the principles of Continental and Indian Forestry to a small English estate, and we agreed that it could be done. That is the history of the Working Plan, but of course the Committee must understand that my estate is a very small one, although in that sense it is typical of a great many English estates. I think that the problem presents rather different aspects in England from what it does in India, or on the Continent, or even in Scotland, but the general principles can be applied.

509. Have you found the control of the woods and their management easier, and the returns better?—Of course it is really too soon to say. You must understand that there was no system of any kind in existence; there was no forestry department of any sort or kind on the estate. I have had to form everything from the beginning. I commenced with chaos, and therefore I am not able to state what the results are.

510. You probably find that it saves a great deal of trouble in making fresh arrangements for one's woods, having everything laid down?—There were no arrange-

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ments made at all. Everything was absolutely haphazard. The thing is now systematised, and runs perfectly smoothly. I know what it will cost me every year. I can make exact estimates of expenditure, and I am even now able, from the natural capabilities of the place, to practically make the returns balance the expenditure, but of course what I am really trying to do is to build up a property which will be valuable to my son and my grandson.

510*. You believe that the question of forestry is one of considerable importance to landowners?—I think it is of immense importance. I do not think English landowners have the slightest conception of the money they are throwing away, or that this country realises the amount of undeveloped property there is in forestry in this country. I may be entirely wrong, but my belief is that in years to come timber is going to be more and more a valuable property in this country, and that there is a very large amount of timber which is required in this country for building and for other purposes which foreigners supply us with, and which, to a large extent, certainly not entirely, we might supply ourselves with.

511. Do you think besides improving the existing woods there might be a considerable extension of the forest area?—I think a very large extension, because under the system of free trade, which has come to stay in this country, a great deal of agricultural land in the South of England is absolutely non-productive, and with an initial capital expenditure in afforestation it will become, I believe, very productive.

512. You find perhaps that the rent of land will hardly pay the fixtures?—No; it does not exist in my part of the country.

513. It has practically disappeared from the great part of the arable land of the country?—Yes.

514. In order to render the woods more productive you think it is desirable that there should be more knowledge of the subject of afforestation amongst owners and agents and foresters?—I do not think there is any knowledge of the subject at all. I think that landowners, the agents, bailiffs, surveyors, and the whole hierarchy of people in England who have to do with land, are absolutely ignorant of the very elementary principles of forestry. They know how to grow a good tree for ornamental purposes, but of what forestry means as a commercial pursuit they have not the slightest idea.

515. I suppose it might be taken that while our ornamental woodlands are the finest in the world our commercial woods are the worst in Europe?—I say most unquestionably the very worst.

516. Would you put in the forefront for consideration the forestry instruction of owners and agents, or of the head foresters and their men?—I think you must get at the owners first. You must make them realise that it is possible for them to very largely add to the value of their properties, that if they do not get any immediate benefit from it their young men will get some benefit later on, and that they are really laying up property of real value for their descendants. If you once get that into their heads then I think it will be useful to educate the foresters, but at the present moment I think a good forester is thrown away on most English landowners, because they do not understand what he is talking about. They think it is a hobby, and they prefer to have rabbits, which is, of course, fatal to forestry.

517. Do you hold any views about rabbits?—Rabbits and forestry are perfectly incompatible, and the English landowner, who is usually comparatively a poor man, has not the slightest conception of what his rabbits are costing him, or what his game preserve is costing him. According to my experience, it is not only rabbits, but it is mice too. The rabbits, of course, destroy anything that comes above ground, but the mice that swarm owing to the destruction of hawks, weasels, and stoats, absolutely prevent the natural processes of nature in afforestation. Millions of bushels of acorns that fall are eaten up by the mice.

518. It always seems rather hard luck that the man who does not keep ground game is the man who has to protect his estates against those who do?—Exactly.

519. Have any of your friends or neighbours shown any disposition to follow your example?—No.

520. (*Dr. Somerville.*) I am very much interested in the question of forest education. I have given lectures at Cambridge, and have consequently come into contact with land agents and owners to some extent. Do you think that it would be a good thing if systematic instruction in forestry could form part of, let us say, the course for an ordinary degree at our English universities?—Anything that you can really do to bring the subject before this country would be valuable, and that would be one very good way of doing it. If you do not begin you will not make any impression anywhere. You have to educate the land-owning class as well as the servants who work for them afterwards.

521. I suppose you would consider it easier to get at the land-owning class through the universities than perhaps through the agency of a fully-equipped forestry school such as we have at Coopers Hill?—I think you want them both.

522. (*Professor Schlich.*) Unless a landowner were a great enthusiast with regard to forestry he would be hardly likely ever to abandon his university course in preference for a technical training in forestry, or to supplement his university course with two years, let us say, at Coopers Hill?—No.

523. (*Dr. Somerville.*) The universities, I suppose, would touch a large number of men, although perhaps it would not affect them so thoroughly?—Yes. I do not think you would get any landowners at present to go through that kind of course at the university, but you might the kind of men who are going to be agents. Agents, of course, have very great influence over landowners.

524. But still the great majority of the young landowners that go up to the universities intend to take a degree, and in many cases they take a degree in law. Do you not think that a certain amount of instruction in forestry might very well form a part of the course, either for a degree in law or for a degree in economics?—I should strongly advise trying it.

525. Your woods, as I understand, are now under a definite course of management in accordance with the working plan that was prepared for them?—Yes.

526. Does the gentleman who prepared the Working Plan visit the woods periodically in order to see that his plan is being carried out?—Yes, he comes down every year.

527. I suppose that the details are carried through by your resident agent or bailiff?—Yes.

528. I presume that your bailiff had no particular acquaintance with forestry before he came to you?—He had a little. His mind had been turned that way, as he had been bailiff on the Northumberland experimental farm where you yourself were.

529. I was only going to lead up to this, that if you got that Working Plan prepared by an expert the man who sees it carried through need not himself have a very extensive knowledge of forestry?—No.

530. In your particular case I suppose you find that Mr. Nisbet's plan is efficiently carried out by a man who has not himself had a great deal of forestry education?—That is so.

531. The Chairman has indicated that a landowner might be greatly hampered in his operations of keeping down rabbits by the invasion of the rabbits from adjoining estates. In the case of domestic animals it is the duty of a landowner to so fence his land that he prevents the animals from getting on to the land of his neighbour and doing damage. Would you consider it reasonable that a game preserver, whose estate was overrun with rabbits, should similarly fence in his rabbits and prevent them encroaching on the land and doing damage to the property of his neighbour?—I have always thought it would be a perfectly reasonable thing to entitle one to claim the fencing off of rabbits.

532. But as the law at present stands you have no power in that way?—You cannot claim it.

533. (*Mr. Marshall.*) You were saying that you find the people who work in the woods know very little about forestry. Does that apply to the ordinary workman? Have you not a class of men in your neighbourhood who understand the going into woods and cutting the underwood, and that sort of thing, and making it up for the market?—Yes, they do that.

534. As far as doing what ought to be done in the woods by way of aiding the tree in its growth, or anything of that sort, they are absolutely ignorant?—They are absolutely ignorant. They are really very good woodmen in that sense; they can fell a tree very well

and are very good copse-cutters and hurdle-makers, but until I taught them—myself having been taught by someone else—they had not the slightest idea of how to cut a branch off a tree.

535. If forestry goes ahead, and people take it up, there will be a great deal of work for men in the woods; would your neighbourhood be capable of supplying as much labour as was required, or do you think there is a shortage of the ordinary sort of working woodmen in your part of the country?—I think there is a tendency to be a shortage undoubtedly now.

536. If the labour was put on a better footing altogether, and people really took up the question of forestry, I suppose the landowner would be prepared to pay good men a little higher wages than the ordinary agricultural labourer gets at the present time?—I think so, certainly.

537. It would be worth it, would it not?—Yes.

538. You told us about the working plan you have adopted. Have you done any planting at all?—Yes.

539. Have you planted mixed woods, firs and larch?—Mainly conifers.

540. Have you larch and Scotch firs planted together, or have you only planted conifers from an ornamental point of view?—No, I have planted plantations; the larch, Corsicans, and Douglas are the three I have gone in for strongest.

541. Have you put them in by themselves or mixed them together?—I started with pure larch plantations, but I had to abandon that because larch disease worked such dreadful havoc with the trees.

542. Have you had larch disease badly?—It was perfectly frightful. It was introduced into my plantation entirely through the ignorance of my people. Of course, I cannot say it might not have come otherwise. But about twelve or fifteen years ago it suddenly occurred to the then bailiff that the young larch plantations were thriving very well, and that he might get an important quantity of faggots off the lower branches, and therefore he cut all the lower branches off. They were tremendously thick, and we could not get through to beat. I cannot say whether larch disease would not have come in otherwise, but when he cut them off that was just the opportunity larch disease wanted, and it came in. In two years there was not an undiseased tree in the whole plantation.

543. I have seen several instances in that part of the country of the same thing, and I think the fault is that the workman, instead of using the blunt side of his hand-bill and knocking the branches off, wields the sharp side, and occasionally breaks the bark. Therefore the tree begins to bleed, and becomes susceptible to the disease?—These were all living branches; there were no dead branches.

544. But I think you will find that when it is very dense like that the lower branches have a tendency to come off without much difficulty?—I do not say they were all dead. They took off thousands and thousands of branches for faggots every year.

545. Were the plantations planted close together?—Not so close as I should put them. They were about 3 feet 6 inches to 4 feet apart.

546. My experience is that if you plant larch 3 feet apart, after five or six years they do very well, and nearly the whole of the young branches are then dead, and you simply send your man in, who goes along and with the back part of the hand-bill, instead of the front part, knocks off the branches, instead of cutting them, and in that way does not do any damage to the tree at all. I quite agree with you that damaging the bark is very apt to make trees susceptible to the disease. What do you think about the rates on woodland; do not you think it would be a great relief to people who want to do something in forestry to be relieved of the rates to a certain extent?—I do, indeed.

547. Would there be any chance of that being done?—Not with the present importance attached to the subject.

548. The subject would have to be brought more prominently forward first, you think?—Yes.

549. (*Sir John Rolleston.*) Except rabbits, there is not anything else that people shoot which hurts young plantations, is there?—There are hares, but, of course, they do not matter so much as rabbits. It is the destruction of the weasels, hawks, and stoats which, according to my experience, has done so much damage.

550. But if anybody was prepared to have rabbits killed down and not destroy vermin, there is no good reason why we should not have a well-planted estate?—No, not the least.

551. In my experience, the objection landowners, young landowners especially, have to planting is that they do not want to have all their game killed down; but I think it is quite possible that you could have a well-planted estate and game as well; is not that so?—Yes, except rabbits. You mean, have the rabbits somewhere else?

552. And the young cover has very much improved the sporting amenities of an estate?—Partridges and pheasants do absolutely no harm at all—quite the contrary.

553. They make a nice cover in dry seasons, and so on?—Yes.

554. (*Colonel Bailey.*) You said that Mr. Nisbet, who made your working plan, goes down to inspect your woods every year?—Yes.

555. Has he made an inspection yet?—He was there in January.

556. Has he reported to you?—Yes.

557. Do you gather from his report that the work he laid down when he left, after framing the plan, was satisfactorily carried out by the local people?—Yes, on the whole. Of course the inspection is made every year. The first year it was very faulty.

558. Then he has made more than one report?—Yes, three I think.

559. So that the men are getting a little educated in the matter?—Yes.

560. I suppose in the beginning there were considerable defects in their work during the intervals when Mr. Nisbet was away?—Yes.

561. What ages are these woods—are they all ages?—They are all ages. What we start with is a comparatively large area, for a small estate, of mixed copse wood with standard trees in it. The whole of this was big oak at the beginning of the last century, and then it was all cleared in the great war—we are only 24 miles from Portsmouth—and the consequence is that the young oaks are all very much of the same age. Therefore these woods have been very much neglected indeed, and very largely destroyed by rabbits and rubbish allowed to grow up amongst the ash and hazel. Another thing is that the whole value of that kind of property is changing. When I was a boy the best under-wood would sell for as much as £15 an acre every 10 years, but now you will not get £3 an acre for it. The hazel is no longer used for hooping, and hop-poles that used to be the great thing in my country are used less and less, because a permanent system of posts and wires has taken their place. Therefore you want to grow two or three different kinds of things. My object was to gradually eliminate the under-wood and grow more timber.

562. Have any of your woods arrived at the age at which under the plan they would be thinned?—Not from the point of view of reaping the crop.

563. But where the crop is admittedly too dense, have you arrived at the stage where the denseness is about to be relieved by properly conducted thinnings?—No. I have several Scotch firs and larch plantations arriving very near to that.

564. What I wanted to know was, whether your people who had not been instructed in scientific sylviculture were able to carry out such a delicate operation as that correctly in the conditions in which they were working; that is, by the aid of a visit paid once a year to tell them what to do. My own experience is that that is a great difficulty. You said a little while ago that you thought it was highly necessary to educate the landowners, in which I fully agree with you. A proposal has been made that a State area should be acquired, owned and managed by the State, to serve as a practical training ground for students from all parts of the country, I do not say necessarily only one area, but an area or areas, and that this would also act as an object lesson for proprietors, who could see by an inspection of it what the possibilities of systematic forestry are in this country. What do you think of a proposal of that sort? Do you think it would be a useful thing?—I think it would be a very useful thing; I think it would be very good.

565. Do you think that that would have a distinctly

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useful effect in moulding the opinion of the land-owning class, and perhaps inducing them to take the matter up seriously?—I think if we could show them in the course of a few years a piece of ground on which an obvious crop was growing which was going to be of real commercial value in bringing a return per acre, such as under no other circumstances that land could produce, that would do more than anything else to convert the English landowner.

556. Can you suggest to the Committee anything that would do better than that?—No. I think that is the very best thing you can possibly do. I think that that, in conjunction with the other suggestions made with regard to education at Oxford and the Forestry School, would be a very good thing. I take it that this would be part of the forestry school.

557. Yes. This forest would be, under the suggestion made, part and parcel of the forestry school; but in addition to educating the students of that school it would also, it is contended, serve as an object lesson to proprietors who have not received any instruction in sylviculture, and who would be able to note and see what was done there. You think that would be a very useful thing?—I think that would be of great value.

558. (*Professor Schlich.*) May I ask what is approximately the area of woodland for which you had a working plan prepared?—I am only speaking approximately, because I have planted a good deal since then. I think eventually—I will put it that way—when I have planted all, it will be about 400 acres.

559. When the working plan was made it was less than that?—The working plan was less than that.

570. And you have arrived at the conclusion that it was a very useful thing to prepare a working plan or management scheme, even for a small area like that?—I did. It served me two purposes. I had really to change the whole character of my woods. Such as they were they were devoted entirely to growing this underwood, which has ceased to have any commercial value at all. I have had to change this into timber-producing woods, and this working plan has systematised that, and shown how it can be done. It can be done, and it should be done. Then, as arranged in advance, at the time when all the ground has been treated with a view of changing the crop it has to bear, it has provided for its future working.

571. You have already told us that you did not see your way to make such a plan with the establishment or staff at your disposal until you engaged the services of a specialist, who had, as a matter of fact, been trained partly in Germany, and had served for a great many years in India. What I want particularly to ask you to kindly tell us is this. There are a great many people who think that if you let a thorough expert into a forest it will probably make a great deal of difference with regard to the immediate financial results. Under the plan which Mr. Nisbet has made for you, do you think you are worse off financially on your original area than you were before?—You mean worse off already?

572. Yes?—No, not worse off.

573. Do you find that the deficit or surplus, whatever it may be, that existed before, if it was a surplus, has not been diminished?—No.

574. The plan has been made in such a way that you probably get a little more income now?—I think that is certainly true.

575. Did you from the very start?—Yes.

576. That is a very important matter, because there is a great deal of misconception upon that point in this country. Just one more question. Dr. Somerville has already asked a question about the education at the Universities. As most of the landed proprietors go to Oxford or Cambridge, would it not be useful for the landed proprietors, whom you have told us it is most important point to instruct, even if it were not part of the degree, to have an opportunity of attending, while they are at the University, a small course on forestry, so as to get some rational ideas on the subject? Would not that be of great advantage?—A great advantage. It is quite certain that if Oxford and Cambridge took it up it would eventually affect the land-owning classes.

577. If a faculty of forestry were established either at Cambridge or Oxford, or at both, should it not be a part of the duty of the lecturer or professor, whoever it might be, to give a condensed course, just suited to the requirements of those who are likely to have the management of large areas of forests in their hands—would not that be of great advantage?—It would be of great advantage.

578. Do not you think it would be of greater importance than the immediate establishment of special forestry schools for the working foresters?—I do.

579. You hold the view that it is of far more importance to an enlightened proprietor, who has actually to determine the thing in the first instance, than to the working forester. I do not exclude the working forester, I mean to provide for him as well; but what I want to bring particularly out is, that it is of the first importance to give the landed proprietors or their sons some opportunity to have some rational ideas on the subject? — I think that would be a very good thing. By landed proprietors I include, of course, the class of agents and solicitors who manage big estates. If you take a very common case, that is a long minority where the real managers of the estate would probably be agents or solicitors working with the guardians or trustees, they would probably think they were doing their best for the property by letting the shooting with very inadequate, if any, covenancy as regards rabbits, and they would get perhaps 2s. 6d. an acre for 10 or 15 years for as many thousand acres as there are of shooting, and in the meantime the capital value of the woodland might be destroyed or diminished. It would be a far greater loss in the future per acre than the 2s. 6d. would be a gain.

580. That could be to a very large extent avoided if the proprietor himself had a tolerably fair idea of the value of the management?—Yes.

581. (*Mr. Stafford Howard.*) How long has your plan been working now?—Four years.

582. Have you found it at all necessary to vary it in any way since you began?—No, only in small details.

583. At all events the carrying of it out depends a great deal upon yourself?—Yes.

584. If it were not that you were there to look after it, too, a visit once a year of Mr. Nisbet would be hardly enough to ensure it being regularly carried out?—Not if I were not there too.

585. Your bailiff would not be able to carry out a plan like that without your supervision, would he?—No. My bailiff is very interested in the matter, and certainly there is no wilful neglect on his part; but if I were not there he would be referring to Mr. Nisbet, and Mr. Nisbet would have to go down much oftener than he does now.

586. Either he or you must be there?—Yes.

587. (*Chairman.*) I have just a short question or two to ask, if you will allow me. It will probably take some time for private enterprise to make much advance in dealing with waste lands. Have you any objection, in principle, to State forests?—No, none whatever.

588. We have had a great deal of evidence that there are perhaps millions of acres which may be successfully afforested, and I suppose that as managers, factors, agents, or head foresters were trained, you think perhaps the State might turn its attention gradually in that direction?—I think it would be a most excellent thing. The machinery exists with the Woods and Forests, and you might begin by forming a real Forestry Department out of that office.

589. In reply to Col. Bailey's question, you regard the object lessons to be given to owners and agents as more essential than anything, and you also agree with Dr. Schlich's proposal of utilising the universities. Would a complete scheme in your eyes therefore be a model school, Forest school, or State model forest in connection with one or more of the universities?—Yes, I think that is the kind of idea I have had in my mind.

590. Do you think that tithes and local rates and death duties are a real bar to plantations?—I could not go so far as to say that.

591. One often hears it said that to introduce commercial woods grown upon the Continental system would disfigure the country. Have you any experience of the woods along the Rhine or the Danube or the Vosges?—Yes.

592. Do you think that those woods are so much less sightly than some of those grown in this country?—No; I think they have a beauty of their own. I do not think you will find the English landowner put that argument

forward if he once thinks he is going to make a good thing out of it.

593. And you think it would be one of the ways in which a country population could be maintained on the land?—I do, most certainly. I think that is a perfectly true point.

594. Are there any other points you would like to give evidence upon?—I think not.

595. With regard to larch disease, would it not be very desirable to have in connection with these model forests plots where experiments could be carried on by the State, showing what trees mix well together, and what cures larch disease, and so on; because the disadvantage of all private experience is that there is no security for its permanence?—None, whatever. The Japanese larch is said to be immune, and I hope it is.

596. (*Mr. Stafford Howard.*) Have you tried any of the Japanese larch?—I have tried it to begin with. I sent for some seedling larch from a nurseryman, and this last year's seedling quotation is 30s. per 1,000.

597. (*Professor Schlich.*) There are several instances on record where the tree has been attacked by the disease. It is no doubt a fact that when we plant the two together the disease first attacks the indegenous plant, but instances are also known where the Japanese has been attacked, but that is rare as yet?—Is the timber equally good?

598. As far as we know with regard to the timber grown in Japan, but what the timber will be like here we cannot possibly say yet. There is, however, every likelihood that it will turn out to be as good here as in Japan, but there is no certainty about it?—Probably you all know it, but I have proved the comparative immunity of the Corsican from rabbits in a remarkable way. If only the Corsican was a safe transplanter its value would be something extraordinary. I planted about 100 Corsicans right in the middle of a small rabbit warren, and the rabbits certainly did not touch 5 per cent. of them.

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599. (*Chairman.*) There is no saying what some of these woods may not turn out to be worth when creosoted?—I found the Corsican was a difficult tree to transplant.

600. (*Dr. Somerville.*) You might get over that difficulty by sowing it *in situ*, making the surface, and putting in the seeds?—I have done that, and the rabbits take the young seedlings, though they do not touch the young tree.

601. (*Colonel Bailey.*) In pursuance of the question as to the advisability of teaching the landowner, you have said that your bailiff or agent develops great interest in this subject. It seems to me that he has developed that interest through your having been educated before him?—That may be so. He had been partially educated by Dr. Somerville.

Sir JOHN W. RAMSDEN, Bart., called; and Examined.

Sir J. W. Ramsden, Bart.

602. (*Chairman.*) You have I believe, planted on a very large scale, especially in Inverness-shire?—I have done so.

603. Of which you have given us a most interesting return?—I have given a return.

604. You believe, do you not, that most of those plantations will some day yield a good return?—Yes, some day or other they will, no doubt.

605. You have no reason to doubt the figures of Mr. Grant Thomson which he gave in evidence before the Select Committee in 1887, that the woodlands in Strathspey would return from 7s. 6d. to 10s. per acre?—I have not seen those returns, but I should certainly put absolute faith in any figures that Mr. Grant Thomson gave, because I believe he is practically the best authority on tree planting and forest management that I have ever had to do with.

606. As you say, you have been very fortunate in your local management in Inverness-shire; but do you think if you wished to recommend the names of three or four young active foresters, well trained, to friends for employment there would be any difficulty in finding them? Are there any thoroughly trained foresters?—I personally could not find one myself.

607. It is very hard to find well-trained foresters?—I could not myself find one. I should apply to Mr. Grant Thomson, and ask him to do it for me. I fancy that even he would have a difficulty in finding one.

608. Do you think it would be desirable to have some facilities provided by the State for the forestry training of landowners, land agents, and foresters?—Undoubtedly.

609. You have some interesting figures regarding the tithe on your Bulstrode estate. Are these a heavier burden even than the rates on the plantations?—They are very heavy indeed.

610. The tithe is a very heavy burden?—Yes, the tithe I think is heavier even than the rates and the income tax. I think you will see that the tithe is the heaviest of all.

611. And you think that these charges are a serious handicap to plantations?—Yes, I certainly do think so.

612. You are trying a great number of the new conifers, are you not?—Yes.

613. Do they do remarkably well?—Some of them grow with extraordinary vigour, particularly the Californian ones, the *Picea nobilis* best of all.

614. And they grow to a considerable altitude, do they not?—None of mine have been planted for more than thirty years. The *Nobilis* and the *Douglasii* grow quicker than any trees I have ever seen, quicker than any trees in England.

615. Your Inverness-shire woods will some day require a very extensive system of facilities for getting the wood away from the felling areas?—Yes, they will.

616. And for all that kind of work, as well as for planting, it is desirable that foresters should have a good theoretical training, so as to be able to put the wood upon the market with the least possible expense?—Certainly, particularly in those out of the way places like Inverness-shire. Take mine, a good deal of it is seventeen, eighteen, or twenty miles from a railway. To make any profit at all it must be manufactured on the spot, and I believe the calculation is that one-third of the whole weight of timber is cut to waste, as backs and outsides. If you had to cart that extra third twenty miles or even greater distances, that would, of course, handicap the value of the timber enormously.

617. And you will have before long to begin the manufacture of timber in Inverness-shire?—I have not contemplated doing so, because I always considered that would be work for the next generation, but I certainly have now to thin, and I have to leave the thinnings on the ground, because I believe it would cost more to carry them to the station than I should get for them.

618. Your expense of planting, apart from fencing, amounts to £2 12s. an acre?—£3 12s.

619. Yes, with the fencing it is £3 12s., but the fencing is put down at £1 an acre?—Yes.

620. It is really hardly fair, is it, to charge the whole of the fencing to the wood?—Fencing is such a very variable charge; it entirely depends upon the extent that you can plant within one fence.

621. As Mr. Robertson, who used to be my forester, says, the trees have not to be fenced in to keep them on the ground?—No, it is to keep the cattle or deer or sheep out.

622. Do you think it would be a good thing to have State experimental areas and forest schools or model forests where all kinds of experiments in growing and in the utilisation of forest products could be made?—No doubt it would be very desirable, if it were possible.

623. Do you think that practical demonstrations would have more effect upon the ordinary landowner and agent and forester than theoretical instruction?—Undoubtedly so; but the two combined would be better. If you could preach your sermon, and then show on the ground the results, that would be far more effectual.

624. There should be a State forest area or a model forest area in connection with some centre for the theoretical training, or some university?—It would be most desirable if you could do it.

625. (*Professor Somerville.*) I do not think I have very much to ask you, but I would like to get a little information, and a special opinion from you with regard to this particular point. You have a large area of woodland, because I see that in Inverness-shire you have planted during the last thirty years something like 10,000 acres?—That is on one estate, but I have planted another 2,000 acres on another estate besides that.

626. I suppose in the course of 40 or 50 years this area

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of woodland will come to be worth something like £40 or £50 an acre of capital value?—I hope so; but I have not made any calculation further than that I have always considered it would be of great value to those who came after me.

627. Assuming it comes to be worth £50 an acre, that represents something like half a million sterling?—Yes.

628. In this country I believe the ordinary head forester is sometimes in receipt of a wage of about £100 a year, and as often less I should say as more; do not you think it is hardly what one might call sufficient remuneration for a man who has the responsibility of the management of capital to the extent of half a million sterling?—No.

629. In other words, does not it strike you that the remuneration of the British forester is scarcely proportionate to his responsibility; that he gets such a small wage that he is not encouraged to educate himself up to the great responsibilities he has to undertake?—You pay him really the market rate that his services command. I have never considered that there is half a million lying on the ground; it is a thing so entirely in the future that I have never really looked at it in that light.

630. Do you think that one would get improved management on the part of foresters if there were improved facilities for education in forestry?—Yes.

631. Do you think that education would make the woods more productive?—I should imagine so, but it is merely a sort of a general pious opinion. I cannot speak with any knowledge on the point.

632. Do you think it would be desirable to introduce the study of forestry into our English and Scottish universities, so that young landowners, in place, we will say, of studying law alone, or in place of taking, we will say, history, should at the universities become acquainted, amongst other things, with the principles of sylviculture, so that they may know and take rather a more intelligent interest in the woods when they come to own them?—It would be very desirable, but I am afraid you would have very few who would attend classes on the subject.

633. Do you think that forestry and agriculture would not appeal quite as strongly to the young landowner as, say, history and law?—Certainly it would have appealed much more strongly to myself, but that is a matter of individual taste.

634. When you were at the university, do you think, if facilities had been offered, you would have studied forestry and rural economy generally?—Forestry I think I should have, as I was always very much interested in it.

635. In fact, you would possibly regret that the opportunities were not available in those days, and are still hardly available?—Yes, but I am afraid practically you would get so very few to attend that you could never keep up the professorship.

636. (*Mr. Marshall.*) The Chairman asked you about the rates. I see in this return of the Bulstrode estate that the rates are now very heavy indeed in proportion to the receipts. I think the receipts average for the sixteen years 6s. 9d. per acre, but by the time you have taken the rates and outgoings out you bring it down to 1s. 3d. per acre?—Yes.

637. Is there any possible way of getting the land relieved from rates?—I am afraid not—at least, I do not know of any.

638. Not by getting Parliament to take it up?—Who is to pay them? Somebody must pay them.

639. I suppose the tithe would be very hard to get taken off?—Yes.

640. But it might be possibly represented that some relief could be made in that way, because by this showing of yours it is very large?—It is an immense burden, but I do not see how you can get over it.

641. If something could be done, you admit it would be a great thing for forestry?—It would no doubt, but the owner of the land under wood is probably the owner of a great deal of agricultural land around it, and if you threw the burden off the forest it would be throwing the burden on to the agricultural land.

642. There was a concession made with regard to agricultural land a few years ago when the rates were reduced by half?—If the legislature would include the woodland in that relief that would be a good thing.

643. (*Colonel Bailey.*) I will just put the question asked by Dr. Somerville in a slightly different form. When you consider the very great capital value of woods like your own, might it not be an advantage to proprietors to pay higher salaries to their foresters, if they could get thoroughly well educated and scientifically trained men?—I think it would be worth while if you could get the men.

644. That is my point, if you could get the men?—Yes.

645. In view of the high capital value, the question is whether it would not be better perhaps to spend a higher proportion in the salary of managers if you could get really well trained men?—Yes.

646. It would follow then that it would be desirable to establish some system of training men of that class?—Yes, very desirable.

647. Do you think it would also be a great advantage for the proprietor class to have the means of getting more sylvicultural information than they have at present?—Certainly.

648. If they were first of all instructed, the instruction of their subordinates might more readily follow?—Certainly.

649. (*Professor Schlich.*) Am I correct in thinking that you also own some beech woods in Buckinghamshire?—My wife owns them.

650. But you know something about them?—A little, but not very much.

651. I want to draw attention to a point in a note by you in which you say, "Larch in mixed plantation amongst firs and other varieties seem less subject to disease, and these look vigorous and healthy." Do you remember what those other varieties are—are they all conifers?—That refers to the woods in Inverness-shire, and is a note which was given to me by my Inverness-shire manager.

652. Are they all conifers?—Practically all.

653. You have a certain amount of larch disease even in these mixed plantations in Inverness-shire?—A certain amount.

654. But perhaps not so much as when you plant them pure?—That is his observation. I had a letter from him only yesterday. He had been round the woods, and he reported that all the plantations containing larch (the mixed plantations) were looking very well, and that there was no disease whatever.

655. In some of them?—Yes, in the mixed ones. Unfortunately in these two plantations where I planted nothing but larch the disease seems to have been the worst.

656. In your beech woods in Buckinghamshire has the woodman who manages them for you ever suggested that you should introduce larch in little patches or in single trees into your beech woods?—No, I do not think he has.

657. I want to tell you that, as far as the experience on the Continent is concerned, for instance in Germany, perhaps the only means to grow larch is to put it in small patches, or single trees, amongst the beech woods, dotted over so that they are practically separated by intermediate belts of beech. Larch pays very well, does not it, if it does not get disease?—Yes; I believe better than any other timber.

658. Do not you think it would be a great advantage if your attention had been drawn to the fact that you could increase the revenue from your beech woods by dotting it over with larch?—Certainly, very much indeed. I am very much obliged to you for the suggestion, and it shall be done next year.

659. I am very glad to hear what you say, because I am now going a step further. If we had a sufficient number of men learned or experienced in proper sylviculture it is just possible that many years ago all those beech woods in Buckinghamshire would have been dotted over with a considerable amount of larch, which would have greatly improved the revenue from those plantations?—Yes.

660. Do not you think that would have been a great advantage?—That would be a great advantage.

661. Do not you think well-instructed men of that class would have been of great importance to the proprietor?—Very great.

662. In increasing his revenue?—Yes, of very great importance.

663. Another question is connected with the same subject. You have planted some 10,000 acres, or 2,000 more?—Yes, 12,000 in all.

664. The oldest of these plantations I see is stated to be of 1873, that is just about 30 years ago?—Yes, nearly 30 years ago.

665. So far your plantations have been very successful, have they?—Yes.

666. When you look, on the other hand, at your old woods, do you find that the revenue from your old woods is very small indeed?—Nothing.

667. They have been managed under the usual old system, have they not?—Yes.

668. Now here you have promising young plantations of 10,000 acres which, as Dr. Somerville has pointed out, some day ought to reach a very high value?—They ought to.

669. According to my idea the real time when skilled forestry comes in is just about beginning in your plantation of 10,000 acres. Have you sufficient confidence in the men in charge that they will do the necessary things, so that they may lead to a higher income than what has been shown before by your old woods?—I am afraid I do not quite follow you.

670. Your old woods had hardly any revenue at all?—Nothing, but those are neglected old woods in Buckinghamshire.

671. But they are the result of the management they had in the past?—Yes.

672. Now you have 10,000 acres. Have you the proper men to look after them, now that the critical time is coming when systematic thinning has to be done, so as to be assured that the woods by proper management will be of high value? Have you sufficient confidence that your manager will do justice to that?—I have great confidence in him as far as his knowledge goes.

673. Do you think he has the necessary knowledge?—Whenever there is a doubtful point I at once consult Mr. Grant Thomson, Lady Seafield's manager. He is very kind, and gives me all the advice I need. That is the best advice I can get that I know of.

674. Are there many men like Mr. Thomson in Scotland?—I know no other so far as knowledge of trees is concerned.

675. So that you are reduced to Mr. Grant Thomson?—I am.

676. Now, do not you think we ought to have quite a number of men like Mr. Grant Thomson in Scotland?—I wish to goodness we had.

677. And ought we not to take measures at once to get them?—Certainly. If you succeed in that it would be of the utmost value to us.

678. (*Mr. Stafford Howard.*) What are the woods in Buckinghamshire that you have?—They are neglected old woods.

679. Are they beech, or what?—Some of them are beech, and some oak at long distances that have been cut for generations as under-wood.

680. And you find that the under-wood is not of much value now?—Very little indeed: it is scarcely saleable.

681. It has not occurred to you, as it occurred to Lord Selborne, our previous witness, that it is advisable to make a change in the system of cultivation owing to the very little value of copse-wood nowadays?—I do not know what change to make.

682. If you read the evidence you will find that he has adopted a plan by which he is going to get rid of the copse-wood practically, I understand, and grow high timber, and as these results appear so far it might be worth while to consider that?—I suppose he would have to grub up all the old stools.

683. Lord Selborne informed us that it was paying him better whilst he was making the change than it was before, or at all events he had not lost by it: the income from his old woods was not less than it was before?—I have always considered that to grub up those old stools would cost many times the value of the fee simple of the land, and it was clearly beyond remedy, and that we must treat them merely as ornamental ground.

684. I would refer you to his working plans by Dr. Nisbet, where you can see what he is doing?—Will you publish these in the Blue Book?

685. I can easily send you one if you wish to have it?—Has he printed a memorandum?

686. Yes?—I am glad to hear it.

687. I see that whilst your gross receipts per acre were 6s. 9d. you are assessed at 12s. per acre?—Yes.

688. Have you not thought it worth while to try to get that assessment reduced?—I think we did try, but you never do get assessments reduced. The Assessment Committee will not attend to anything of that sort.

689. I suppose one reason for the tithe being so high as 3s. an acre is that some of it is old arable land?—Yes, a good deal of it has been arable land, but that is not where the tithe is so very high. The tithe is high in the part that has apparently been wood from all time.

690. There is one wood where there is no tithe at all?—Yes, that is a beech wood.

691. How do you account for that?—I cannot account for it. There is a wood of large extent called the Duke's Wood, where the tithe is heaviest. I do not think it is sub-divided in that return.

692. Do you consider it would be reasonable that when relief was given to agricultural land it should have been extended to woods as well?—I think that might have been done. It would no doubt have been a great relief: it would take off half the rates.

693. Are you troubled with rabbits at all?—I keep a man on purpose to keep the rabbits down, to exterminate them as much as possible.

694. And you are strongly of opinion that rabbits are quite incompatible with making woods pay?—Absolutely.

695. Do you think that the shooting rents that some people get are equivalent for the damage that rabbits do?—No. In my shooting agreements in Scotland—and of course most of the land is let for shooting—I always reserve power to destroy hares, rabbits, roe deer, and squirrels. I do not know which is the most mischievous.

696. At your discretion?—Yes.

697. Do you give notice to the tenant that you intend to do it?—No, in Scotland I do not. I reserve power to do it, except when he is residing there, which is practically during August and September; for all the rest of the year I keep the power in my own hands.

698. And you think it necessary to reserve the power in your own hands?—Absolutely necessary.

699. Have you ever sent your foresters to see what is going on on other estates?—Only to Lady Seafield's estate.

700. You have not thought it worth while to go round to other large estates and see what may be done?—Are you speaking of Scotland or of England?

701. I am speaking of Scotland, but it will apply equally well to England?—My manager was sent to me by Mr. Grant Thomson, and has always sat at Mr. Thomson's feet, and I have always sent him back to Mr. Thomson for any information he might require.

702. You think there is nobody he can get more information from than Mr. Thomson?—No, I think he is the best practical authority in Scotland, and I have never gone beyond him.

703. Some years ago we took some of our foresters from the Forest of Dean to France, to see the system there, and we found it had an immense effect in the interest it gave them, and the widening of their knowledge. I should think that even visiting large estates in England, where you know woods are well managed under a competent forester, might give a great deal of experience to a forester of your own?—I do not know of any well-managed woods. I should be glad if you could tell me of them.

704. I was told by a very well-known forester, Colonel Pearson, that he considered forestry was a science that came by observation. Do you not think that the more observation you get of different places the better your knowledge will become?—No doubt it would be desirable, but I really do not know anybody who does pay much attention to their woods in England.

705. Do not you think it would be an advantage to learn from the faults of other people?—I think it would take a man a good deal of time, and I do not know whether then he would learn much from them.

706. You do think a State forest or a model forest, where there would be a school that people could go to for a long time or a short time, would be a great advantage?—If you could have one where a young man training for a forester could go for a year, or something of that sort, and combine the practical planting and

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pruning of trees with the theory, it would be of great advantage, I think.

707. He ought, in fact, to be regularly employed as a forester under proper supervision?—I think that would be the best.

708. Do you think that would be a great advantage to the foresters of this country?—A very great advantage.

709. If such an establishment as that existed it would be an advantage?—Certainly.

710. (*Professor Schlich.*) You have planted, according to this statement, some 10,000 acres; would you kindly tell us how that land was used before it was planted?—It was partly under deer, and the rest was under sheep.

711. Have you any idea what the land was worth before you planted it—the income derived from it?—Something very small indeed.

712. What would you estimate it at?—I really could not say.

713. Approximately?—It would be such a mere guess, but I could not put it at more than—well, I really do not like to say, because I should be making such an utterly vague shot.

714. Well, can you give us that vague shot?—I would rather not, because I might mislead you.

715. Was it 2s. an acre?—I should say it would not be worth more.

716. (*Professor Campbell.*) Is heather growing on the ground?—On a good deal of it, but some of it is richer land, and grows bracken.

717. And that is the land you have now planted?—Yes. Of course on that extent of ground there is every variety.

718. What is the altitude of the land?—The lowest point would be about 800ft. It is from 800ft. above the sea to getting on to 2,000ft. On anything above 1,500 or 1,600 feet above the sea you merely plant just to make a shelter, but you never expect to see timber.

719. (*Chairman.*) There is only one point that I should like to ask another question on, and that is the wages paid to foresters, of which we have heard so much. There is no doubt that, considering the capital you find upon the land in large woods as compared with the capital in agricultural land of similar value, the wages paid to the wood manager would be considerably less than what are paid to the land manager?—Do you mean less than would be paid to the farm bailiff?

720. No, I would go a little further than that. Supposing you had an agricultural estate of £5,000 a year, worth £100,000, and you had £100,000 worth of wood upon another area of land. The wages of management of the agricultural land would be very much higher probably than the wages of the management of the wood land?—Very much, I should think, because on the agricultural land you would have to do all agricultural operations—ploughing, sowing, reaping, etc., whereas in the woods you simply have occasional thinning. You have not to help the crop in the woods, as it is growing of its own accord.

721. On the Continent the men who would be in charge of £100,000 worth of wood would be quite as highly trained men as the managers of £100,000 worth of agriculture?—If you set up your school we shall be very glad to get the men.

722. As matters stand at present, if the land-owner were to place £100,000 worth of agricultural land under the management of a labourer, at £1 a week, his action would attract public curiosity, but he might place the same man in charge of £100,000 worth of wood without losing his character as a prudent man of business?—Agricultural land producing £100,000 would be a very large affair.

723. I mean £100,000 worth of land, producing £4,000 or £5,000 a year?—The manager of the agricultural land would require to possess much more varied knowledge.

724. That would probably hardly be the view on the Continent, where the forest officers are as highly trained as any land managers?—We are benighted in that way, and I have no doubt your woods would pay very much better if you knew how to manage them better.

725. (*Dr. Somerville.*) I suppose that on your extensive estates in the Highlands you have a large number of sheep farms?—Yes.

726. I suppose that the rents have been coming down very much indeed of late years?—I have them all in my own hands. They came into my hands about 20 years ago. When the leases expired they were all thrown on my hands. I have taken over the whole thing.

727. And you have practically no land let as sheep walks now at all?—Only comparatively small extents attached to arable farms.

728. But at any rate it is within your knowledge that sheep rents have been coming down very much indeed?—Enormously, particularly in the wether farms.

729. That is the higher ground?—Yes.

730. There has been great difficulty indeed in letting sheep farms?—Very great; I should say an impossibility.

731. I suppose that this difficulty of letting the farms is largely due to the fact that the stock is bound to the ground, and the incoming tenant has to pay more for the stock than he would get if he realised in the open market?—Yes. It is notorious that there is a legalised system of robbery in these valuations.

732. Now, the rent of sheep land has almost come to a vanishing point?—Certainly on wether farms.

733. I believe there are cases where a stock of as much as 5,000 or 6,000 sheep is let for a matter of £200 a year?—Roughly speaking, my experience is this: I get nothing at all upon my capital which is sunk in sheep, but the farms just pay their way, and leave me the wool as a rent. The wool is now becoming worth next to nothing.

734. When sheep farms are thrown on the landlord's hands, he has to take over the stock, of course?—He has in Scotland.

735. Do you think that the position into which sheep-farming has fallen of late years, the unremunerative condition of the industry, will induce land-owners to turn their attention more in the direction of using their land for forest purposes?—Unfortunately, you see, there is the loss of the rent. Generally Scotch land-owners are not very well off in the way of money, and when they have lost their rent from sheep they have no money they can use in planting. If they had the money I have no doubt they would turn the land to better account in that way.

736. Do you think that this would present an opportunity for the State doing something to encourage tree-planting, either through the agency of loans under supervision, or through the agency of the State acquiring areas of suitable land and carrying on the business of forestry as a State industry?—Yes. I suppose there has never been an opportunity when the State could buy land in the Highlands cheaper than it can do now.

737. (*Mr. Marshall.*) With regard to the relations between your forester and your head gamekeeper, do you find the forester's operations are much interfered with by the keeper's restrictions, keeping him out of the woods at particular times?—I do not find so in the least.

738. Is he independent of the keeper?—He is above the keeper.

739. (*Chairman.*) Is there any other point you would like to mention?—No, I do not think so.

Mr. A. Slater.

Mr. ANDREW SLATER, Land-Steward, Osborne, Isle of Wight, called; and Examined.

740. (*Chairman.*) You are land-steward at Osborne?—Yes.

741. You have also had some experience of Scottish forestry?—Yes, in various parts of Scotland.

742. What are your views generally as to the condition of forestry, and the training that is available at present for foresters or land managers? Do you think their training leaves much to be desired?—Yes, I think considerably much to be desired in the way of training young men for managing woods. For instance, there is no place where they can obtain training except at Coopers Hill and the Edinburgh Botanic Gardens, and I do not consider they are able to acquire a thorough knowledge of forestry in that way without practical knowledge as well.

743. You think there is a great need for a model forest to show how woods should be grown?—Yes, and I should like also to have a school in connection with

the forest. I do not think there is any use having a school separate from the forest; it would be most inconvenient to the men who joined the school, and inconvenient in many other ways.

744. Do you think that many foresters would go to a central forest school, or that they would be best reached by lectures given in different centres? Speaking of theoretical instruction, not the object lesson?—I think the best thing would be to have both combined. It might be worked very much in the way it is worked in the Botanic Gardens at Edinburgh—take the young men who wish to become foresters, train them, and instead of having outside labour on the forest areas, let these young fellows do the work of the State in the forest, and train them in scientific matters as well at the same time.

745. Do you think Edinburgh is a good centre?—Yes.

746. What do you think would be a good centre in England?—I do not know. I should not start with too many schools at once. I would take one to start with in a small way, and allow it to develop as time went on. Afterwards, if they were successful, others could be created elsewhere.

747. What do you think are the present conditions of British woodlands?—I do not consider them in a very satisfactory condition.

748. Do you think it has been shown that they can pay?—All the figures I have given in my statement, I think, show that they have paid. The figures are not complete, simply because I do not know what was taken out of the woods before.

749. You think that with improved methods British forestry would come to rank as a great and profitable home industry?—Yes, providing proper land was planted. Of course, if land was of too great a value before it was planted it probably would not pay.

750. Do you think there is much waste land in Britain that could be profitably planted?—There is a great amount of waste.

751. A large amount?—A very large amount, both in England and Scotland.

752. Do you think there is much land in farms, which now returns very little, that could be profitably afforested?—Sheep farms, certainly.

753. Are not there a great many arable farms that do not pay a rent on their fixtures?—I do not know. I should not care about planting land of any great agricultural value.

754. Not, at any rate, when it is once properly cleared?—No. If you plant land at too high a rental it of course cannot be expected to pay in forestry.

755. Do you find foresters as a rule keen for opportunities for a thorough training?—I think so—at least a number of them are.

756. How far is the average head-forester in this country competent to manage his business? Does he know how to deal with the manufacture of timber? Can he tell you what amount of timber there is on the ground, what it costs for haulage and transport, and for cutting it up?—I think most of them have an idea of that, and how it should be done.

757. But they would be none the worse for a thorough training?—No, in scientific matters. I think they know all their practical work very well.

758. You think they know their practical work very well?—Yes.

759. Do you think they know their planting well?—Yes, but they require to know the scientific part as well.

760. Do you think they know the manufacture of wood as well as they know the planting of it?—Most of them do, I think.

761. Do you think they know, as a rule, how many cubic feet of timber there ought to be on a given area of land?—I do not know about that.

762. Or whether there is too much or too little wood on the land?—No, I do not think they understand that part of the matter.

763. There would have to be other facilities for training them on points of that kind?—Yes. These are the points on which mistakes are made: having too little on the land, and too much thinning.

764. A State model forest, or forest in connection with a school—a demonstration area—I suppose ought to be on a site where every kind of demonstration could be given?—Quite so.

765. It is very important, I suppose, to have a thorough course in all forms, not only of growing timber, but of utilising forest products?—Quite so.

766. Is the practice of planting woods carried to a great extent in this country?—No, I do not think so.

767. Do you think many owners and agents know much about the practical working of their woods?—I am afraid not.

768. (*Professor Campbell.*) You say that foresters know their practical work very well?—Yes.

769. I suppose they are all agreed as to the manner in which the practical work should be performed?—I think so.

770. They agree among themselves very well as to methods?—Yes.

771. You are of opinion that they require further training?—Yes.

772. And you are also of opinion that that training should be given in a practical school?—Yes.

773. Now, if you wanted to engage a forester, how many years would you like him to have been in that school before you engaged him?—Supposing he had had a training before he went to the school, a practical training, it would be very much better, and probably then a couple of years at a school would do.

774. You prefer that he went into an ordinary wood first and worked there, and then went to school afterwards?—I think it would be better.

775. Supposing that a young man of 17 could find employment in a State forest, where there was a school attached to it, would you prefer that he should go there first?—I think I should prefer that he had a training before he went, so that he could better understand what he was being taught.

776. Have you any special reason for saying that?—I was acquainted with practical work before I went there, but I should probably be better able to pick up matters in that way which were taught there than if I went there not knowing anything about it.

777. But you want the young forester who goes there to know practical work, do not you?—Yes, and scientific work as well. Of course, it would be of great benefit to these young men—who are probably not very well off—that they should not have to pay a high fee and keep themselves as well if they went to these forest schools. If they could be paid wages and be taught at the same time it would be better.

778. We will assume they would be paid for their work; they would be working men. In such a case you would prefer them to go first to the forest school?—No.

779. You distinctly prefer them to be taught at home first?—I think so.

780. Is that because you have any doubt as to the character of the instruction to be given?—No, I think they would be much better trained outside. Afterwards they could probably see something they could not see outside in the work at the school.

781. Two years, you think, would be sufficient?—I should think so.

782. You have mentioned the training at the Botanic Gardens in Edinburgh; can you tell me a little more about that?—I do not know much about that. Of course, they cannot get much practical training there, because they have not a proper area. There are no woods there, but only a few trees in the grounds.

783. Would you approve of training the landowner, or the agent, or the forester more highly?—The landlords and agents might be trained in the principles of sylviculture, and the forester in these and the practice as well.

784. In England, as a rule, is it the agent that takes the management and supervision of the estate?—Large estates have foresters, but, of course, the forester is under the supervision usually of the agent on most estates.

785. So that it is really the agent who is the prime mover in all matters relating to forestry?—Yes. He would be consulted by the forester as to the clearing, planting, and other such matters connected with the forest department, and, of course, sanctioned, or otherwise, by the landlord through him.

786. Therefore it would be the agent whom you would educate?—Yes, in the way I have stated; but, of course, the agent has simply the supervision, and not many of them interfere with the forester.

787. But it is of the highest importance that he should

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be educated?—Yes; as he has the management of the estate it is desirable he should know, from his own knowledge, whether matters are being carried out properly or not.

788. And you would educate him rather more highly than you would educate the working forester?—Yes, in the scientific details, so that what knowledge the forester might lack he might be able to apply.

789. But you would provide instruction for both?—Yes.

790. (*Professor Schlich.*) You are directly connected with the management of an estate or estates?—An estate.

791. The value of this estate, as I find, you have estimated with compound interest 3 per cent.?—No.

792. But what about this table that you have given us?—I have worked this out from certain tables.

793. So we all do—so do I. But what I want to bring before the attention of the Committee is this: that you have given here (*Appendix V.*) an example of 40 acres of mixed larch and fir, which I suppose will go on our records as an appendix. You state that the land would be scarcely worth 1s. per acre?—Yes.

794. And you have been even so generous and so liberal as to enter into your calculation 2s. per acre?—Yes, including expenses.

795. I beg your pardon. You mean that 2s. would cover the rent and the annual expenses?—I think so—1s. would cover the rent, at any rate.

796. You put the initial cost at £3 10s. per acre?—Probably it did not cost that. I could not tell you what it cost, because that was done long ago.

797. But you think that would cover it?—Yes, more I think, because 60 or 70 years ago things were done very much cheaper than they are now.

798. I am sorry to say I have not checked your calculations, but I have not the slightest doubt they are correct. You show that the result of this 40 acre plot, calculating with 3 per cent. compound interest, would be equivalent to an annual rent of 6s. 2d.?—Yes, that is for the forest-rent. The 2s. ground-rent is allowed for in the calculations; that is an additional rent of 6s. 2d.

799. As a matter of fact, if you had not taken the 2s. out, you would have had an annual rental of 7s. 2d., if you had not charged the 1s. rent?—Yes. This 6s. 2d. is brought out by discounting the profit down to the first year.

800. It would be practically profit, after paying a rent of 1s.?—Yes.

801. So that practically your land would have returned you 7s. 2d.?—Yes.

802. May I ask why you chose 3 per cent. interest?—It was a fair amount of interest.

803. It was a reasonable amount of interest to charge, you think?—Yes.

804. Now comes my question. You know that the Government can borrow at 2½ per cent.—have you ever tried a calculation at 2½ per cent.?—No, I have not done so.

805. I have not had time to do it. Have you an idea of what it would come to if you took your money out of consols, or you did business with money borrowed by the State at 2½ per cent.? Do not you think it would come to double what you have put down here, say 12s.?—I do not think that it would affect it so very much, because the expenditure is treated in the same way as the income.

806. It would make a very great difference?—I can work it out.

807. However, you are satisfied that land of that class can be made to yield an annual rental on the soil of 7s. 2d.?—Yes, probably more than that under proper management.

808. With 3 per cent.?—Yes. Of course part of that is only assumed. Previous to 1884 I do not know what was taken out of it, and I assumed there was £1,500 worth taken out before, and probably a considerable amount more than that was taken out.

809. That is not essential with regard to the point I am driving at. You are convinced that this would give a considerably larger rental on the land than if the land had been kept for its previous purpose, and yielded 1s. an acre?—Very much more.

810. In fact you say seven times more?—Yes.

811. If it were 2½ per cent. it would be probably 12 times more, so that really with land of that class, surplus land, it would pay the State to invest money in it?—Yes, undoubtedly.

812. You have no doubt about that?—No doubt whatever.

813. They would really get more than 2½ per cent. according to your calculation?—Yes.

814. You are satisfied about that?—Quite satisfied.

815. (*Colonel Bailey.*) Of course you know very well that there is a feeling that the system of management hitherto pursued in woods in Scotland is not exactly what it might have been?—I think that is so.

816. People are beginning to think, a good number of them at any rate, that it is not quite rightly done?—Yes.

817. Do you think that that opinion has been extended recently; do you think that a few years ago, say 20 years back, the feeling was different from what it is now?—Yes.

818. Do you think that a considerable number of these men in whose minds that feeling prevails, have a desire for instruction in scientific forestry?—Yes, I think so.

819. You think there are a considerable number of foresters in Scotland who would be glad to avail themselves of instruction in scientific forestry?—Certainly.

820. And you think the desire for that instruction has developed in recent years?—Ten or fifteen years.

821. Have you ever thought what the reasons are for that development?—I think perhaps there have been more publications on forestry lately, and they begin to see from these publications that they have not been working on proper lines. They see also perhaps, from the system that is pursued abroad, that their system entirely differs from that.

822. A great many of your friends and acquaintances have been with the excursions of the Arboricultural Society to see the woods in North Germany?—Yes.

823. You were one of those yourself?—Yes.

824. Do you think the few days they spent in those woods awakened their interest on the subject?—There is no doubt about that, I think.

825. And that would probably be one of the causes for the change of opinion?—Yes, that is one, and a strong one, too.

826. Does that circumstance lead you to think that if the State had a model forest in which things were properly done, and which might be visited by such men, the educational benefit would be considerable?—Yes.

827. Do you think that if an object lesson was provided for them that would be a great national benefit?—Yes, it would be.

828. (*Sir John Rolleston.*) I think you said that your experience was like that of Lord Selborne, that landowners as a rule took very little interest in forestry?—I did not say that. I said they did not know much about forestry. Of course there are a great many landowners who take a deep interest in forestry, although perhaps they do not know much about it, or how to carry out a system.

829. You think as a rule that the landowners are interested, and would like an opportunity, if they could get it, of becoming acquainted with it?—I should think so.

830. I do not quite know myself how you are going to instruct the landowners at any of these colleges. It seems to me that the agent or factor, or whatever he is called, is the most important person to instruct, because he exercises influence over the landowner. Is not that so?—Yes; but of course landowners who wish to take an interest in their estates can easily take a course at some of these places, so that they can get a proper understanding of forestry. It is a most interesting occupation.

831. And it is most desirable economically that the study should be encouraged in every way?—Yes.

832. (*Mr. Marshall.*) You mentioned that the foresters who have come under your observation were fit to undertake the practical part of the work in woods?—Yes.

833. What about the supply of foresters?—Could you to-morrow, or at any reasonable time, get a young practical forester to work in the woods?—Yes.

834. That does not coincide with my experience. I have been trying for over a year to get men to work in the woods, and I have advertised in the papers, and done all that I possibly could. I only want a practical man to cut down a tree and work under me, and I cannot get that class of man?—I think you should have no difficulty in getting him.

835. I had lately to go to Bristol to get one. Now, with regard to the supply of woodmen to work under a forester, have you a good supply? If you wanted 20 men could you get them?—Perhaps not on the spur of the moment.

836. Supposing more was done in the way of forestry, and a little higher wages were paid than are ordinarily paid to the agricultural labourer, there would be no difficulty about the supply; you could get plenty of men?—I think so. I have had no difficulty in getting men for that sort of work. I am talking of ordinary labourers.

837. In what part of the country?—In the North.

838. In this interesting statement you gave about the 40 acres of larch, can you tell me about what the price per foot of the larch and spruce was?—At that time part of it was sold very cheaply. It was afterwards we got a better price.

839. I mean for your two main lots?—Fully 1s. a foot.

840. And the spruce?—That would be cheaper, about 2d. or 3d. at that time. But that was very coarse stuff.

841. (*Dr. Somerville.*) You have taken a great interest in the development of forestry education?—I have.

842. And you have taken an active part in the movement that has gone on during the last 12 or 15 years?—Yes.

843. I think you yourself have given lectures on sylviculture to a class at the Botanic Gardens in Edinburgh?—Yes.

844. You had not, I suppose, the same opportunities in early youth of getting a technical education of a scientific character in forestry?—No.

845. Do you regret the lack of these opportunities?—Certainly I do.

846. And you consider it is the duty of the State, or of some other body, to provide these opportunities now?—Yes.

847. Do you consider that some such system as this would meet the demands at the present moment, that in those institutions for educational purposes to which young landowners resort they should have the opportunity of studying what we will call the principles of sylviculture?—Yes.

848. You would not consider it very desirable that young landowners should actually themselves go through a course of training in the operation of planting with a spade?—No, I do not mean that.

849. They require in fact to be instructed in the broad principles of the subject?—Quite so.

850. And you consider then that these principles could be properly instilled through class-room instruction?—Yes.

851. In fact, you think that if such facilities were provided at the universities and at the agricultural colleges, it at any rate would, to a large extent, meet the wants of the landowners, and the prospective land-agents?—Yes, I think that is quite right

852. You, I think, would like to see a practical forest school or schools established with illustrative woods in the neighbourhood?—Yes.

853. You would not in that case dissociate science from practice?—No.

854. It would be then, I suppose, sufficient for the young men who went to these schools to put in a certain amount of practical work, so as to earn wages enough to cover the cost of their instruction?—Yes.

855. They would not be men who could pay anything like £20 a year out of their pocket for instruction?—No.

856. But they would be glad to take advantage of it if they could get it, through their work, as it were?—Yes.

857. You know, of course, about the forestry education in Edinburgh through the University and the Botanic Gardens?—Yes.

858. I suppose during the time you were lecturing at the Botanic Gardens you often found the want of some demonstration area to which you could go with your class, and say, "Now then, I have been lecturing to you about under-planting, or about the mixture of shade-bearing and light-demanding trees, and so on, and there you have actually before your eyes the plantation showing these mixtures." Do not you think that many young foresters who may read books about forestry actually have never themselves had the opportunity of seeing the principles practised which they are reading about, and do not you think a demonstration area would be a proper place to have these principles practically illustrated on the ground?—Yes.

859. You have given us a very interesting example of the financial aspect of forestry, that land has been raised in value materially by being utilised for tree planting. Is there any such area as that within 1½ hours of Edinburgh?—Yes, within an hour of Edinburgh.

860. Was this particular illustration of yours taken from plantations within something like one hour from Edinburgh?—Yes.

861. And, in fact, such land is actually and positively available within an hour of Edinburgh, where the land is not worth more than 1s. an acre, and which has been so materially improved by sylvicultural operations?—I did not say that. That particular area was not worth more than 1s. an acre, but there are other areas in the neighbourhood worth from 1s. to 2s. 6d.

862. Still, Edinburgh, you would consider a first-rate centre for the development of scientific forestry combined with a demonstration forest within an hour of the city?—I do not know that I would put it in that way. I would rather have the school in the area, so that there would be no expense of travelling to and fro from the school to the forest.

863. We agree with you in that: you would have the school on the area, but it would be desirable, would it not, that this area should be still accessible to those attending the University classes?—Certainly.

864. And all within an hour of Edinburgh?—Yes.

865. (*Chairman.*) I am afraid that at present the Government can hardly borrow at 2½ per cent., but I suppose, in addition to the actual interest on the money, there would be expenses in connection with the supervision of the plantations which had been formed with the aid of State loans—the State would have to keep an eye on the management of plantations which it had encouraged by loans?—Yes, in some way, unless it handed it over to the authorities connected with the school.

866. But in any case you could not give loans of public money to private estates without taking ample safeguards that the money was not being thrown away, as it is in so many of the plantations which we know of?—Yes. It is not likely that an area could be got altogether entirely adapted for forestry; there would be probably farms on the area as well.

867. I was speaking of the encouragement of plantations by private owners by the aid of State loans?—I think they advance money for that purpose now.

868. It is taken advantage of?—I do not know whether it is taken advantage of.

869. Have you ever head of its being taken advantage of?—No, I have not.

870. I was asking you about foresters' knowledge of certain parts of their profession. Do you think that thinning is well understood in this country?—I do not think so. That is where great mistakes are made.

871. Foresters do not beleve in dense growth, do they?—No. That is a mistake which is made, and the trees grow up rough and coarse, and not fit for structural purposes.

872. Do you believe in woods being managed under a methodical system, according to fixed forest plans?—Yes. Of course when a landowner changes his forester, probably the new forester would upset every thing that the previous forester had done, and they are frequently changing. Where proper work has been done, on a proper plan, the managers could not alter the system.

873. The management of wood land on an estate is liable to be changed, not only through change of owner-

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ship, but through change of factorship, or change of forester?—Yes. If the working plan was adopted that of course could not be done.

874. Is there any other point you would like to make a statement upon?—I would just like to say that by the acquisition of a forest area, in addition to the benefits that would follow as an educational and training centre for young men, it would also prove of great value as an experimental station, as well as where investigations could be methodically entered into as to the causes, and prevention of, the diseases to which forest trees are subject.

Mr. W. B. Havelock.

Mr. WILLIAM BREWIS HAVELOCK, Forester to the Earl of Yarborough, Brocklesby Park Estate, Lincolnshire, called; and Examined.

875. (*Chairman.*) You have had a long experience of forestry in Lincolnshire and Yorkshire?—Yes.

876. And I believe you have found it possible to make forestry pay?—Yes, I think so. I have had the good fortune to be upon well-wooded estates.

877. Are you much troubled with game?—Not on the estate where I am at present; but I have been where there is a good deal of game.

878. The trees have had a fair chance at Brocklesby Park as regards game?—Yes, an extra good chance. There has been no expense spared for wire netting, and in many cases it has not been necessary to net at all.

879. You have also had to do with the utilisation of forest products; you have done some saw milling?—Yes, but not much sawing for sale. All the sawing we have done has been consumed on the estates or sold to the tenants at a reduced price.

880. Is the creosoting work carried on on the estate?—Yes, we can use all that we can creosote. I think we are able to use more than we can creosote.

881. Do you find that you are able to produce high qualities of timber fetching a high price?—The very best timber I have seen anywhere, both in Yorkshire and in Lincolnshire.

882. Both hard woods and conifers?—Yes; the best larch in England I should say grows on the Duncombe Park Estate in Yorkshire, and I should say some of the best ash in England grows in Lincolnshire. The Lincolnshire ash is very well known.

883. I suppose you find that under your management the net profit to the estate of the woodlands has been better than the net profit upon the agricultural land when you take into consideration all the outgoings?—Yes, taking into account the buildings and the value of the land, and comparing the original value of the land. As a rule the plantations are on the poorest land. In regard to the estate I am on, I cannot exactly say, because the plantations were probably originally planted for shelter, appearance, hunting, and game purposes. But on Lord Feversham's Duncombe Park Estate, there is hardly any woodland upon level ground. It is nearly all upon hillsides and impossible to cultivate, and worth hardly anything for sheep grazing. It is worth very little indeed.

884. At Lord Feversham's you were not entirely clear of game?—No.

885. Supposing you had been free of game the return would have been even better, would it not?—Yes, but game did not affect the old timber when the trees were first planted. When the trees were first planted, according to the traditions of the old woodmen who were living when I went there twenty-three years ago, if the first Lord Feversham saw a rabbit anywhere when he was riding about, if he did not see the head-keeper himself that night he sent someone to see him, and that keeper had to be there next morning, and that rabbit had to be caught. I have told that more than once to the present Lord Feversham, and I may say he quite agreed with it.

886. He has not always followed the practice himself?—He is a keen forester himself, and has tried to do both, *i.e.*, grow both timber and game. There is no expense spared in wire netting on either estate, but I consider wire netting to be a delusion.

887. Do you regard the extreme preservation of game as being the chief obstacle to the growth of timber in this country?—Yes, it is the chief obstacle. It discourages both the owner and the forester. The damage is forgotten in the course of three or four years by everyone but the forester. The rabbits will do so much damage now, and it is not taken seriously into consideration, but after two or three years have gone by many trees are found to be dead.

888. Is there a tendency to fence off parts of the estate where rabbits are kept from the rest?—I have not had any personal experience of that, although I have seen it.

889. Taking England all over, I suppose there is a pretty fair sprinkling of rabbits in the country?—Yes. Even on the farms where the tenants have the power of killing the rabbits.

890. Apart from the game question, do you think there is a great need of a good demonstration ground where you can show what mixtures would do best, how to plant different kinds of trees, and the results which follow different methods of planting trees, and the best methods of preparing timber for the market, getting it there, and manufacturing it?—Yes.

891. When you say there is a need of a suitable forest managed on economic sylvicultural principles, where owners, agents, and foresters can have an object lesson on how to grow to pay, you mean, do you not, that you would have a demonstration forest where every practice connected with forestry and the manufacture of timber might be carried out and shown?—Yes, I am very strongly indeed of that opinion.

892. Do you think that object lessons are more valuable than theoretical training?—I think they are twenty times more valuable; I know that from my own experience.

893. People want to see a thing?—Yes. I remember the first time I went to Castle Howard Estate and saw a plantation of young oak there; twenty years ago I had never seen young oak grown like that before, and I never forgot it. I tried to do the thing myself, and the young oak plantations in Yorkshire, when they grow up, if they get the chance, will probably be as good. I saw it could be done by careful management, and I have endeavoured to do it. That is twenty-three years ago, and I never forgot what I saw then.

894. And you found you could derive special advantage from having seen this?—Yes, that is just one instance out of many.

895. And you would like to see that done with all kinds of trees?—Certainly.

896. In the same way by having plots of land laid out for different kinds of trees, when the clear cut comes at different ages, and if properly done, it would prove that so much land had returned so much clear profit?—Yes.

897. And nothing else will make a great many people believe that woods will pay, I imagine?—No; nothing will do it but that. It is a very difficult matter to get proper book-keeping. You know, sir, I daresay, from your own experience, that that is so. At Brocklesby we keep very strict books, and put everything under its proper head, but even then there is a multitude of things put on the woods which have nothing whatever to do with growing timber. For instance, take the wire netting. I have argued the question with the present Lord Yarborough and his agents, and asked them why the woods should pay for the wire netting. Wire netting does not make the trees grow any better. I have also asked them, why should the trees pay for the fencing. There is not a yard of fencing round the woods for which the woods have not to pay. You do not go on to a single farm and find all the fencing belonging to that farm. If there is any small expense, and they do not know where to put it, if one does not watch the clerks in the Estate offices, they will put it on the woods.

898. The fences are in no case required for trees unless occasionally along a public road?—No, they are not. As a rule in my experience they are all charged to the woods.

899. And what about the roads?—All the roads in the woods are charged. That is another great grievance with me as a forester. I feel very deeply about these things, because we hear so much said about forestry not paying. With regard to the roads, we have to keep the roads in many of the woods fit for driving a carriage and pair on them. It is not only a road necessary for moving the timber over, but broad well-kept

roads or rides running through the woods, charged to the woods. I did not see that in Germany. Going through the woods in Germany in a carriage and pair you had to sit back and hold tight in a great many places, or you would stand a chance of being thrown out. There, woods are only planted for timber, and if the roads will carry the timber that is all that is expected of them. But we have to keep roads and rides level and in good order, and fill up the rabbit holes, and the whole expense is debited to the woods.

900. Do you know the gathering grounds of any of the great Corporations where they gather water for their water supplies?—I know some of them in Yorkshire. I am rather interested in one just now for the Harrogate Corporation on Lord Masham's estate. I know it very well.

901. Do you know that Dr. Schlich and others have shown the extra amount of water that can be obtained in the gathering ground by its being cultivated by trees?—Yes, I have read of that.

902. Is there much tithe and local taxation charged to your woods?—Not much tithe in the woods I have to do with at present; as far as I know most of the woods would not be tithed very highly. But I often think they are rated at per acre really more than the land is worth. I believe the woods are rated at 10s. an acre all round, and the land is not worth it. I am just speaking from recollection, and that is subject to correction. I could easily get the exact figures.

903. Would you advocate the total abolition of local taxation on wood?—I am hardly competent to give an opinion upon that matter.

904. For instance, it occurs to me that you might have a parish in the Highlands altogether under wood, returning a very large rental and maintaining a large population working the wood, and in that case to provide the local taxation it would be necessary to have some powers of rating?—Yes.

905. In the woods that you have managed, have you made them readily accessible for the removal of timber—I mean with regard to roads?—Yes, that is the first thing I consider if it is a new plantation, namely, to make suitable roads, although it is not always necessary to do that. But I prefer to make the road first.

906. Is that a provision that is usually made in English woods?—According to my experience it is.

907. They are pretty well laid out for getting timber from the felling areas to the market?—Yes. The roads that I have to do with at present are remarkably well laid out for that.

908. Do you use traction haulage?—Yes, and have done so for the past eight years.

909. Do you find that is very economical?—Yes; it is the best thing that has ever come upon any estate.

910. We have had some evidence, but according to that evidence it is not common?—I know five or six places that have traction engines. The Duke of Northumberland has them, and so has Lord Cadogan; he has either bought one or is on the point of buying one; and there are other gentlemen I have heard of.

911. Do you think that the sale of timber is much handicapped by transport charges and railway charges?—Railway charges, yes. I will give you an instance of transport, which is only part of the question. Until Lord Yarborough put down his creosote plant eight years ago, we sold the great bulk of the Scotch fir and spruce. We have both, although we have not a great quantity on the estates, because the land will grow something better than those timbers. The timber leader used to get as much per cubic foot for leading the timber from the wood to the station, which took him one day, as Lord Yarborough was getting for growing that timber for nearly 80 years. We were getting 2d. and 2½d. a foot, and it was costing nearly that for getting it to the station. The railway charges to the Midlands, where the timber was chiefly used, were 4d. to 6d. per foot. That was one of the arguments I urged upon Lord Yarborough to get him to put down a creosoting plant to creosote the spruce and fir. It was necessary to have the creosoting plant to be able to use the cheaper sorts of timber at home, and creosoting produces most excellent results. If you were to take and examine the spruce posts that were put down eight years ago you would find them to all appearances as good as when they were put down. If they had been put down uncreosoted they would not have lasted two years.

912. Did they take the creosoting?—Spruce takes the creosote worse than any timber I know. I have the creosoting book here, and I will put it in for you to see. *Mr. W. B. Havelock.* 23 Apr. 1902.

913. A proper experimental demonstration area, equipped for all purposes, ought to show creosoting and transport just the same as the growing of the wood?—Yes.

914. And you find that you effect considerable economies?—Yes, but it is difficult to show them in actual £ s. d.—difficult to show what these savings are. You cannot make a balance-sheet and show you have spent less or bought more in; and if you cannot show it in that way you cannot get people to believe it. If you can show them in actual cash on one side or the other they believe you; but if you begin to work it out and say that if you had not used this creosoting plant and had used oak, larch, or even ash, it would have cost so much more, they do not seem capable of taking that in. They look more to the annual expenditure and compare one year's expenditure with another year's expenditure, probably forgetting in the meantime the extra work you are doing.

915. In the mere matter of transport by traction or haulage it is easy to show what the saving is, because you can show the old carting bills with the cost of the traction and the staff?—Our traction engine is used entirely for work on the estate; we should require another one for hauling to the station.

916. Have you found foresters keen to acquire knowledge? Are many of your men anxious to push on and get a good training?—I have come across a good many.

917. You think there are plenty of foresters who will take advantage of facilities for mastering their profession if they have opportunities for doing so?—Yes, if they can afford it. At the present time I have the offer of two young fellows who desire to come to me. If they could go to a forest school they would not go to a forester. I have had two or three people before as pupils.

918. Do you think that all classes connected with timber growing, the owner, the agent, and the forester, equally need training?—They all equally need training, but I really think the forester knows most about it of the three, as a rule. Land agents, as a rule, have not had the opportunity of studying forestry, and not many of them perhaps profess to know it.

919. Do you find many landowners interested in their woods?—Speaking for the two I have been with, they are very much interested in the woods. There is not much of any importance done on either estate before it is laid before them. They see the whole thing and decide whether to plant or to fell.

920. I suppose many landowners are interested, but their interest ought to be backed up by knowledge to a greater extent, you believe?—Yes; if they knew more they would go more in for it, I think.

921. (*Mr. Stafford Howard.*) How many estates have you been connected with?—I have been head forester on two estates, and I received my training under my father, who was a woods manager for practically all his life.

922. In Scotland?—No, on estates in Northumberland owned by the Lords of the Admiralty.

923. Where were you before you went to Brocklesby?—I was with Lord Feversham in the North Riding of Yorkshire.

924. On the estate where you are at present they have managed the woods carefully for a very large number of years, have they not?—Yes.

925. And kept very careful accounts?—And kept very careful accounts.

926. But on the whole does it show that the timber has been grown at a profit for all the series of years?—I think I can say so, and with Lord Yarborough's permission, which I think I could easily get, I could show that by the books.

927. Has it been more profitable than land which has been otherwise occupied?—I should not like to say that, as many of the woods were planted not for timber, but for effect and shelter.

928. That is usually the case in large estates, is it not?—Yes; the rides are then very wide, which is really harmful and has injured the growing timber.

929. Have you much copse wood there?—Practically none at all.

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930. No copse wood?—Not true copse wood. We think the other pays better.

931. You do not find so much demand for copse wood now, compared to what the demand used to be?—There is a local demand for copse woods to make into hedge stakes and thatch pegs and "tray ties" (a local name used for rods for holding straw to hurdles for lambing shelters).

932. You can always get rid of what you get: there is sufficient local demand for the smaller stuff?—Yes, we never waste any.

933. You were speaking about a visit to Castle Howard when you saw this oak plantation. What particular lesson did it teach you—to improve your plantation?—I saw the distances they were standing apart and the fine shape and condition of the trees. They were beautifully formed trees, long, clean-stemmed, and when they came to be fully grown they would be models of what an oak tree should be, in my opinion.

934. What did you proceed to do to imitate it?—I thick planted to begin with, and also I got a little information from the forester in charge there. I was planting some similar land at Duncombe Park at the time. The young oaks were not growing very well, and I hardly liked to cut their heads off. I was only quite a young man then, and did not care for cutting the heads off the trees without knowing that I was right. But when I heard what had been done to some of their young trees, I came home and had many heads cut off within about half an inch of the ground, and stuck the top in so that the men would not cut the shoots off with the rubbish next summer. I was in that plantation last winter, and I found the oaks were growing beautifully. They were as straight as an arrow. Three or four shoots came away, but we left the best one. The oaks were planted about ten feet apart.

935. Therefore your visit to Castle Howard when you saw what was going on there was a great advantage to you?—Yes, on that particular point.

936. You say the rates are about 10s. an acre?—Yes, the rateable value. They are rated at 10s. an acre, and that is about the average.

937. Do you consider that is above the value of the land?—I think it is above the value of the land.

938. Compared with what crops produce?—Compared with the farming land.

939. I mean what your woods produce. Your woods may produce more than the farming land, and if so they may be rated higher. You think it is unfair considered in relation to the value of the woods and what they produce?—Yes, I think it is. One reason is that I think a great deal of land in the woods is not planted; such, for instance, as the wide drives which you see in the Dukeries, but, of course, that is all measured in the area of the wood.

940. You must take an average for the whole?—I have always thought it was too much.

941. Have you worked out the wood accounts sufficiently accurately to know what you are making, so as to put it before the Local Authority to show it was overrated or over-assessed?—We could easily do that.

942. But you have never tried that?—I was never asked to do it.

943. When you speak of roads being made in new plantations, do you mean roads simply to get about, or real hard roads?—Roads just to get about. I would not make a hard road until it was needed, and it is not often needed except where there is a bog. When roads are needed let the road be made to fetch the timber out, and then level the ruts when done with.

944. Where you have a large area of timber, and you are constantly cutting, it might be advisable to have good central roads?—Yes. I agree with a good central road in a large plantation. I had a plantation like that in Northumberland, which now belongs to Mr. W. B. Beaumont.

945. At Dilston?—Yes. There is a central stoned road in one of those woods, but it was a 500 acre plantation, and this hard road went right through the wood.

946. It makes a great deal of difference as to what you get for your timber whether it can be taken away easily or whether it is only taken away with great difficulty?—Not so much difference as the distance of the station from the woods makes, I think you will find in practice. Timber merchants, if they contract for the leading, as many of them do, reckon that if a team can go once in the day to the station with a load it is worth so much a foot. If it gets beyond a certain distance I do not care how good the road is, he could not go more than once a day. Amongst timber leaders you do not see anyone who lays himself out for leading timber going to the woods with one set of horses. They will have more than that, they will have at least two sets of horses, that is, six horses, and sometimes nine horses. It has to be a bad road in the wood if six or nine horses cannot pull a load of wood out. It must be something extraordinary.

947. Then the distance from the station affects it more than the actual state of the road in the wood?—That is my experience.

948. Do you cut up your own timber, or sell it standing?—We sell it standing by private tender, or felled by public auction, or privately, direct. We have a sale of 28,000 feet at the present moment. I also sell privately to the tenants. As a rule I make it a point to sell it publicly in some fashion, either by tender, standing, or by private tender felled, or public auction. I prefer to do that for my own protection.

949. And do you find the prices improved of late years?—Yes.

950. Distinctly improving? — Distinctly improving. Take larch, for instance, because I have had a considerable experience with larch. Lord Feversham owns a great extent of larch. In a certain wood larch was making 10d. per foot 20 years ago, and the larch in the same plantation to-day—and it has not grown so very much, as it has been ripe for some years—is worth from 13d. to 15d. Larch has risen perhaps as much as anything in timber.

951. Are you troubled with larch disease in young larch trees?—Not much in Lincolnshire, but very much so in Yorkshire. We plant larch pretty freely in Lincolnshire.

952. (*Professor Campbell.*) You are in favour of providing technical education for foresters?—Yes. I felt the need of it myself.

953. You yourself have found the want of it?—Yes.

954. Have you men under you to whom you would like to give a technical training? We do not want to go down to labourers, I presume; you do not anticipate that the school would provide for the labourers? It is for those immediately under you: men who are aspiring to the position of head forester?—I have one or two at the present time, and I have seen young men at various times who wished to take up the profession of forestry, and I have one or two who would like to improve themselves.

955. Have you in your regular employment one or two men under you who want to have a technical training?—I cannot say I have just now.

956. That is to say, you yourself direct the workers?—I act through the foreman, who is a middle-aged man. As a rule they are all married men, and they would not have the education to begin with.

957. If he had been a younger man he would have wanted it?—A few of them, but I am sorry to say that it is the exception in Lincolnshire: not many men show that desire.

958. It is a pretty large estate, is it?—We have from 5,000 to 6,000 acres of wood, and the whole estate is about 50,000 acres.

959. So that the technical training required would be for the head foresters?—Head foresters and head foresters' sons. Many of the ordinary working men do not know sufficient to wish to improve themselves.

960. So that the number that is wanted per annum would not be very great?—Not very many, I think. I think there are as many competent foresters in the country at the present time as there are good appointments for.

961. Do you think they are especially well trained?—Yes, I know a good many trained men, but there are no appointments for them.

962. Do you think that if a larger number were trained there would be no demand for them?—Not under present conditions.

963. But if there was a revival of forestry?—If there was a revival of forestry, of course there would be a demand.

964. You mentioned that you occasionally get pupils.

Are these young men who wish to become agents by-and-by?—I have had men come sometimes who have taken up the subject of forestry in order to pass the examination at the Surveyors' Institute. I have had one or two University men come for a time, men who intended to be land agents.

965. How long do they usually stay?—They stay a year, but it is far too little. It ought to be two years at least in order to see everything, and see twice round the year's work.

966. But a well-educated man would learn forestry in two years, you think?—Yes. He would learn a good deal in that time.

967. Do you think on small estates that the forester would readily avail himself of the services of an expert if such were provided for him? Suppose, for example, that a proprietor of a small estate wishes to plant, and he had the opportunity of obtaining the advice of a good expert, would that be taken advantage of by the forester—would the forester be amenable, do you think, to instruction?—I think the younger foresters would.

968. And do you think that the landowners themselves would be very glad to take advice?—Yes, I think many of them would.

969. In fact, there is a great desire on the part of landowners to be able to obtain the use of experts?—Yes, a desire to a certain extent, but I could not say it is a very general desire.

970. It is chiefly on small estates, I presume?—Yes.

971. (*Mr. J. H. Lewis.*) Do I understand you to say that fencing against game is a delusion?—Yes, it is.

972. Do you consider that by this time rabbits have become so artful that no fencing can keep them out?—I do not mean that.

973. Then in what sense do you say that fencing is a delusion?—I am speaking to gentlemen who know something about rabbits, I expect. Rabbits get in—it is not for me to say how they get in, but I have my own ideas. If I do not see a man actually making a hole through the netting I cannot say he made it; but I was told by a land agent in Lord Yarborough's estate office, a land agent who was talking to Lord Yarborough's agent, that he had seen keepers make holes through the netting. I have never seen that done, and although I may have had my suspicions at times, I should not say anything unless I was certain.

974. Is it not a fact that even keepers consider that in this respect rabbits have become more artful during the last few years, and that, as in Australia, where it is credibly reported they have developed certain arrangements for climbing fences—they have not got so far in this country, perhaps—altogether they are very much more able to climb over fences than they used to be?—Yes. Where a 3ft. netting would turn rabbits a few years ago it is not safe to use less than 4ft. to begin with.

975. Is it not the practice of landowners at the present time to increase the height of the wire fencing very considerably? Even in some cases not putting wire netting round the woodlands of less than 5ft. in height?—I have never seen any used 5ft. in height, but I have seen a 4ft. netting; 4ft. is the height, and allowing for the part that goes into the ground, it stands 3ft. 6in. above the ground, and that is the highest I have seen yet.

976. Have you seen any 4ft. from the ground?—No, not 4ft. from the ground; 4ft. is the original size of the netting, 1½in. mesh.

977. You have travelled, I think, in the North of Germany?—I was with the Scotch Society's excursion in 1895.

978. Do you consider that the German methods could to any extent be adopted in this country with advantage?—Yes, but the game question comes in here. I have often thought—it is only my opinion—that one reason why the woods in England are so overthinned is that foresters have been obliged to overthin for game cover, and that applies nearly all over the country. If we consider a real good crop of timber to be such as we saw in Germany, I may say that I have seen equally good timber in England. You can see as good spruce growing in Killarney as any I saw in Germany, and also as good spruce on Lord Feversham's estate which has hardly been thinned at all. They are 70 feet high and very well grown. Foresters have been obliged to thin in many cases to get bottom cover. There is no bottom cover in these thick-grown German forests. As far as the boles of the trees allow you to see, you can look right through the woods. You may say there is no bottom cover. There is plenty of rotten leaves, and so on, but you do not see any briars and bushes such as we have in this country. You cannot grow a heavy crop of timber and underwood together. It is impossible to do it.

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979. Do you think that it is not owing to want of agreement with German methods so much as owing to reasons of preservation of game that thinning has been practised so very much in this country?—That is one reason, but it is also no doubt owing to ignorance on the part of many foresters. Many foresters have not been away from their own particular places, and have not seen how the work is done in other parts.

980. Do you think that under a proper system of forestry instruction in this country forestry could be made very much more profitable than it is at the present moment?—There is not the least doubt of it.

981. Have you observed large areas of land in this country that might be profitably planted and more profitably used than at present?—Yes; in all the three counties I am more particularly acquainted with. I know the North Riding remarkably well, and the north part of Lincolnshire very well, and many parts of Northumberland. There are thousands of acres in these parts which could be planted, and which have never been planted, which would grow timber well.

982. In your statement you account for the fact that owners do not plant on the ground that they have not in many cases sufficient capital to do so. Can you suggest any method by which that difficulty might be overcome?—No, I hardly can. I am not very greatly in favour of the State advancing money for planting. I do not think that many landowners would care to have the supervision necessary. It would be of no use for a landowner to plant trees unless there was very effectual supervision, from the rabbit point of view alone—on that single point.

983. Do you think that the sporting landowner might come into conflict with the State on that question?—I think it is highly probable. Even if the owner who borrowed the money and planted insisted on keeping rabbits down, you do not know what his successor might do.

984. In view of the fact that there are these large areas of uncultivated land which are suitable for afforesting, and that in your opinion a conflict might arise between the landowners and the State, if the State were to advance money to the landowner subject to State supervision, would you be in favour, if the State would consent to it, that the State should undertake to some extent work of that character?—Yes. If the State will do it.

985. You think it might be profitably done as a matter of business on an extensive scale?—Yes, I am thoroughly of that opinion.

986. Another reason which you give why owners do not plant is their lack of interest in forestry. Do you think that forestry instruction would arouse amongst landowners themselves greater interest in this question?—Yes. Particularly if you could educate the younger generation, the sons of the proprietors.

987. Would you not feel inclined to say that the shortness of life and the uncertainty of heirs, the uncertainty as to who a man's heirs may be, and so forth, operate, to a certain extent, as a deterrent to planting?—Yes, undoubtedly it does.

988. But, of course, shortness of life does not apply to the State—the State never dies?—Quite so.

989. (*Professor Schlich.*) I believe the forest estates which you have under your management at present belong to the Earl of Yarborough, and amount to about 6,000 acres?—Between 5,000 and 6,000; scarcely 6,000.

990. Am I correct, but I think I have seen it somewhere stated, that the average income of that is about £1 an acre? I have also seen it stated somewhere that the expenses are about half that?—That is overstated; 5,000 acres would mean £5,000 a year, but the expenses are scarcely half that.

991. I have seen it in some publication, wherever it was. I think it was in the "Land Magazine"?—Lord Yarborough gave me permission some time ago to draw out a statement, if I chose to do it, for as many years back as I cared to go, with regard to the expenses and the receipts, but it takes a good deal of doing.

992. Generally speaking, you would say that the ex-

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penditure at present comes to about half the income or more; shall we put it that way?—It does not come to half; it is considerably below that. I might say that we are planting close up to the felling. There is no land which has been allowed to lie fallow, and we have planted a great deal of new ground into the bargain which the old woods have to pay for.

993. The woods have been more or less regularly managed now for 100 years?—I have a list here for 115 years showing how many trees have been planted every year.

994. It is of much importance to know whether woods in this country which have been managed for a great many years in a good or fairly good manner would actually pay or not. You have given us some information with regard to the rating value of these lands, and you said your forests are rated at something like 10s. an acre?—Yes, that is about it.

995. That same land for agricultural purposes would be worth how much—the rent that is paid per acre? I think you say something about 7s. 6d.?—That is on another estate. The 7s. 6d. an acre referred to another estate in Yorkshire.

996. Give us a general idea. If the land is used for agricultural purposes, what should it be rated at?—Ten shillings would be too much for that.

997. In other words, you mean to say that, it being forest, it is rated higher than it would be, or ought to be, if it were used for agricultural purposes?—It is so. It is difficult to persuade the assessment committees of that.

998. That is another point. My point is that it ought not to be rated at that if it was used for agricultural purposes?—There is one farm on the same estate equipped with modern buildings and everything of that kind, which is not let for 10s. an acre; in fact, for two or three years there was no rent at all. It got into bad condition, and the tenant had it for one or two years for nothing.

999. If I understand correctly, you told Mr. Stafford Howard that the forests were practically rated higher than the land would be if it were used for agriculture. Did I misunderstand you?—I think at the present they are so, because the rental of the arable land in Lincolnshire has come down so tremendously in the last ten years. It has come down one-half in some cases.

1000. What I am driving at is this. Supposing these lands give now a net revenue of 10s. an acre, a great portion of the income is really derived from deferred income, is it not? Because the woods when they were first planted, for a number of years gave no revenue at all?—Quite so.

1001. And, therefore, if you are rated now at 10s., you are overrated?—That is my opinion.

1002. That would not be the average from the formation of a plantation up to the time it is cut over. It is only after you have established a certain stock of timber on the ground that the net income of 10s. begins?—Yes.

1003. What I want to bring out is this: That the rating for existing forests at their present annual net return is, of course, on a wrong principle—that that is not the way to calculate the rating value. Do not you agree with me that the utmost that forests ought to be rated at is the rating value which they would have if they were used for agricultural purposes?—Yes, I do agree with that.

1004. Or, do not you agree with me in this, that the lands ought to be rated from time to time according to the income which they yield; that is to say, for a number of years they ought not to be rated at all, because they are not giving an income?—Yes, that would be better still.

1005. And then they should be rated at a higher rate for the rest of the time while the woods are maturing?—Yes.

1005*. (*Mr. Stafford Howard.*) It would be a very high rate at the end of that time?

(*Dr. Schlich.*) The point which I am making for is this, that you must forego your income for a considerable number of years before you have established any return from your capital?

(*Colonel Bailey.*) You have actually to pay out, and not to receive?

(*Mr. Stafford Howard.*) It would greatly upset the rating authority if you had such varied payments?

(*Witness.*) The simple way is to rate them according to what they are worth as agricultural lands. If you will allow me to say so, if these woods had been planted just with the idea of growing timber as a paying matter, a great deal of the land that is planted would not have been planted. There are hundreds of acres near the Hall, which are valued now at 20s. per acre. No one would think of planting that land with forests pure and simple. I take it that you want to get land at 5s. an acre, or even less than that to begin with. I would not expect such good land to pay for planting.

1006. (*Dr. Schlich.*) My present object was to draw attention to a certain principle on which I suppose further evidence will be taken from some other gentlemen. I maintain that to rate forests according to what they yield at a particular moment is wrong in consideration of the fact that the land does not give any return for a number of years before, and that the utmost you can put on it is what it is worth for agricultural purposes from the start. That is only a casual question which I was going to ask. I believe your estate has been administered more or less regularly for one hundred years. I think I am correct in saying that it is one of those estates in England which might serve as a pattern of management. If you were to go over all the estates in England you would find few estates which could serve better as a pattern of what ought to be done than the forest you are now managing?—I have not seen one so good.

1007. I now want to draw your attention to a very special point. I may be wrong in it, but you can correct me if I am. You are speaking of what you learnt by looking at certain trees. Is there not one portion of the estate which you are managing in which there are certain oak forests on some elevated ground which have not done as well as they might have done; and was there not a great discussion that the wrong kind of oak had been planted there?—I have heard that question discussed by Professor Fisher when he went over the woods with me. He advocated the planting of the sessiliflora for the dry ground there, I think.

1008. Of course there are two varieties of oak, the pedunculated oak, and the sessile oak. This is the pedunculated oak?—Yes, the pedunculated oak is what we have got.

1009. That is on somewhat elevated land?—Yes, on chalky land. It is not adapted for growing oak. It would pay better there to grow ash, beech, or larch.

1010. Do you agree with the view that it would have been better to plant the other kind of oak, if any at all?—I have not had a long enough experience of the two classes of oak. I have both sorts in the nursery, but I have not had sufficient experience of them in the woods.

1011. I think it was fairly agreed that the wrong kind of oak had been planted on the hills?—That was Prof. Fisher's opinion, but personally I have not sufficient experience. My opinion would be worth nothing, because I have not had sufficient experience.

1012. I was further told that there was some proof that the sessile oak had done very well somewhere in the vicinity of an adjoining estate in the locality?—On the Chatsworth estate there is some land very similar to ours, and I noticed it there after Prof. Fisher had mentioned it. I had never heard the point raised until Prof. Fisher mentioned it to me. He pointed it out, and I could then see how much better the sessile oak grows there.

1013. (*Mr. Marshall.*) At a higher elevation?—Yes, and on dry ground.

1014. (*Dr. Schlich.*) What I am driving at is this: that even on the estate which you consider certainly one of the best in England, and which you have administered for a good many years, mistakes have been made in past times?—Certainly.

1015. And in those cases a little more instruction in proper sylvicultural methods and so on in past times would have probably led to better results?—Not exactly in this case. Other reasons operate sometimes. If there is a shortness of money, money must be raised. Perhaps the owner does not care to clear a piece of ground entirely there and then, and he may be advised by someone that there are sufficient young trees underneath them to justify picking the old ones out. I have never seen that succeed yet. I do not say it is not possible, but in my experience it has not answered to

take out a large portion of the old timber and leave the young trees in. It may do in a sheltered valley, but it will not do in the woods that I have in my own mind.

1016. The point I was getting at was that I understood from information given to me it was fairly admitted that even in these best managed estates of England considerable mistakes had been made in the past in certain localities?—I quite admit that.

1017. In other words, that a little more knowledge of sylviculture and sylvicultural laws would have been conducive to better conditions than are actually present in forests which are otherwise well administered?—Probably. But I would not like to give a decisive answer to that, because other things come in. One reason why oak was planted on this land might be that oak in that day was oak, and was worth a good deal of money. It is also a very useful timber for estate work, and that might have been in the minds of those who planted the land.

1018. It is not a question of oak or not oak, but what particular kind of oak. Experience has shown that in certain localities one oak thrives, and in other localities the other oak thrives best?—I repeat I knew nothing about that until I had had my attention drawn to it two or three years ago.

1019. One more question about these rabbits. You say it was usual to keep rabbits out of plantations, and you have already told us that they generally get through the fence and not over it. Of course, you can make a fence which rabbits cannot get over by bending the top outwards?—Yes.

1020. If you only make it high enough the rabbit cannot jump over it clear; it is almost an impossibility to get over it, and it is safe unless the gamekeeper makes a hole?—Yes.

1021. You have told us that he does so because he meets thereby the view of the owner who wants the rabbits to escape?—I do not say that it meets the view of the owner. I do not think that an owner cares to put up a wire netting and then have the rabbits deliberately let into the enclosure.

1022. There is a confliction of aims and objects, the one putting up the fence and the other making holes in it?—Yes, various personal reasons may enter into it.

1023. In many cases these woodlands have depended in the past upon considerations of game, etc.?—I think that is one reason.

1024. And ignorance of proper thinning is another?—Yes.

1025. Do not you think that taking all these points together it is of the utmost importance to disseminate clear ideas about the value of woodlands and their power of yielding a return, and more particularly to impress that information upon the owners of land?—Yes.

1026. You think if the owners of land had a clear conception of what it means by allowing game to destroy their woods and their plantations, and if they had a clearer conception of what they might expect from their lands if they excluded game, at any rate, from certain parts, it would have a beneficial effect?—Yes, upon many of them.

1027. (*Colonel Bailey.*) I daresay you know it is a recognised principle of sylviculture that in all operations carried on in a crop of trees you aim at producing the best possible final crop upon the ground; that is to say, that one of the chief guiding principles of thinning is to take out the worst trees and allow the best trees to stand to make the final crop of the highest value. Do you think that principle is followed in most of the woods that you are acquainted with?—The forester thinks he is following that principle, but, owing to lack of knowledge, he does not.

1028. Is it not often the case that the condition of the final crop is wholly neglected by taking out the best young trees in order to supply orders from time to time? I am not speaking necessarily of the estate that you are managing yourself, but you must have seen a great many others?—It is done on a great many estates, but I have never been called upon to do it myself.

1029. You have seen it done?—Yes, many times. They pick them out to make the most money at the moment.

1030. Do not you attribute to that false system of sylviculture the failure of a great number of our woods to yield a satisfactory profit?—Yes, of many of the woods.

1031. Is it within your knowledge that private proprietors often leave the woods long after they have ceased to grow profitably, because they have a feeling that people make remarks that they are cutting down their timber? Do you think proprietors dislike to cut down their woods even long after they have ceased to grow profitably?—Yes, that is a fact. *Mr. W. R. Havelock.* 23 Apr. 1902.

1032. Do not you think that, if the woods on such estates were properly organised under a working plan, so that the amount of fellings to be undertaken each year were laid down on business principles, the very detrimental system of leaving ragged woods standing long after they produced anything, would be modified?—It would to a great extent, because I know that many gentlemen attach more value to the opinion of an independent expert than perhaps they do to their own foresters.

1033. Do not you think the existence of a working plan showing what quantities of wood ought to be cut down every year would do a great deal to remove the prejudice that exists against the felling of timber?—I think it would.

1034. I have often heard it said that proprietors of woods do not wish to undertake the systematic management of their estates, because they fear that this would lead to formality and regularity of the crops, which would destroy their artistic beauty. Do you not think that on most large estates, even supposing that feeling were allowed to prevail there must be considerable areas of land which might be put under regular management?—Yes.

1035. Without in the least degree interfering with the artistic beauty of the parts that are near the houses and along the drives?—Yes, I think so.

1036. You think on most estates areas could be found which could be managed systematically on business principles, without interfering with the amenity of the estates, or with their artistic beauty?—Yes, I might almost say on every estate of any size.

1037. Just so, that is what I think myself. Did you join the excursion of the Arboricultural Society to Germany?—Yes.

1038. How many days were you there?—About a fortnight.

1039. You saw a great deal that interested you that you had not seen before?—Yes.

1040. You think you learnt something even in that short time?—I did.

1041. Do not you think that a State area such as some of us think of proposing would have a most important beneficial effect in showing people what might be done on the soil and in the climate of this country, and would have a great influence on the management of our woods?—Yes, I think that is the best thing that could be done.

1042. (*Sir John Rolleston.*) I would like to ask you one or two questions in regard to your methods of sale. I believe your estate is a very well managed estate in which these things are well looked into. What are your methods of sale of timber, as between the selling by private treaty and by the auctioneer?—We sell, broadly speaking, in three different ways. At the beginning of the felling season, in November, we sell large masses of timber, clearing the ground entirely, selling the trees in lots by tender as they stand. The forester makes a valuation of these lots which is submitted to the owner. The timber is advertised and tender forms printed, and we sell the timber to the timber merchants in £300 or £400 lots. I do not care to put them in larger quantities than that.

1043. You sell upon tender?—Yes.

1044. Do you employ an auctioneer at all?—Not in that sale. We do during the winter in selling the thinnings and some small fellings. We, as a rule, either haul them to the drives by horse power or by traction-engine, and sell them in lots, what we call waggon loads, from 60 to 120 feet each.

1045. Having felled them yourself?—Yes, by piecework, and drawing them out by our own horses or traction-engine. We sell them in from 60 to 120 feet lots, by catalogue, by auction, but the auctioneer only gets a fee for the day. He has nothing to do except to come on that particular day and sell the timber; he has no responsibility for the money.

1046. You have never sold the timber as it stands by auction?—I have never done that, and I would not

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care to start it unless the owner was going to take the whole lot down, because it would be very awkward, if you thought you did not get a sufficient price for it, to take a few here and leave a few there; but selling a big lot standing, if the owner does not think the price comes near enough to the forester's value he can reserve it. We reserved two lots last winter. Of course, I am running a great risk in this case. They were two lots of about £600. Upon my advice Lord Yarborough reserved those lots. We felled them ourselves, and now they are going to be sold by auction in a fortnight or three weeks' time. If when we reckon up the expenses of felling, of hauling, and what we shall get at the sale it puts me in a funny position if we make less than what we had offered us for the timber when standing. However, I am risking that.

1047. You express an opinion about hedgerow timber. Would you kindly tell the Committee what your views are about that?—On many estates a great deal of hedgerow timber might be taken down with great advantage both to the landlord and the tenant. The timber is standing idle, and it becomes nearly valueless. The great objection to taking hedgerow timber down is that it spoils the appearance of the country, but I think that could be overcome if the landlord would make it a condition in negotiating with the tenant that he should take down a certain tree on condition that he might be allowed to plant two or three more in its place. But the tenant must help the landlord to protect the tree from needless damage, because these trees if planted will never do the present tenant of a farm any damage at all.

1048. You think it is a crop that is well worth the attention of landowners?—Not so much as a crop as to beautify the estate, to make the country near the residence more worth living in.

1049. (*Mr. Marshall.*) I have very little to ask you, because you have already given us such good evidence. I would like to ask you a question with regard to this sample of timber that was sold in the North Riding of Yorkshire. I see you put down in your statement 120 ash trees with an average cubic contents of 14 ft., *i.e.*, 1,690 ft., at 1s. a foot. Surely, that is a low price for ash?—They were small ash trees, rather rough. They were not very good ones.

1050. As compared with the ash which you grow at Brocklesby that is a low price?—Yes, we make much more than that price in Brocklesby.

1051. Now as to supply and demand. First of all with regard to labour, do you get plenty of labour for working in the woods? Can you get plenty of men to work under you?—So far we have been able to get plenty of labour.

1052. Do you pay them more than you would an ordinary agricultural labourer?—Yes, they earn more.

1053. Therefore if there is more done in forestry you think there will be no question about the supply of labour? You think that there would always be a supply of labour available for the woods?—Yes.

1054. And that it would also give the labourers a chance of bettering their position?—I do think so.

1055. Now as to the supply of timber and the demand for timber, you say that at Brocklesby you sell it in various ways, and you nearly always have a good demand for it?—Yes.

1056. And even if you had more you would very likely sell it?—Oh, yes, I think so.

1057. That is because you have got an estate which is noted for the good quality of its timber, I suppose?—I suppose it is.

1058. You have a speciality for growing ash, I believe?—Yes, but not only ash—beech and larch also.

1059. Is the demand for timber this year as good as it was last, or have you experienced what has been experienced in the South of England, a fall in the price of oak?—The timber trade is rather slack at the present time, certainly.

1060. Is this timber, which you refer to, oak?—No, chiefly beech.

1061. The fall in price will not affect that at all?—There is little oak in the present sale.

1062. You have an abundant supply of labour, and you do not think there would be any difficulty about that if forestry were taken up, and there would be no difficulty in selling the stuff, anyhow in England?—No.

1063. That applies to oak, ash, elm, and conifer?—One reason, in my opinion, that the timber sells so well at Brocklesby is that it has been a regular thing for many years. We do not cut a lot one year and none the next; we do a regular felling every year, and that is known to wood leaders, who lay themselves out for carrying it to the station. The buyers seldom send their own horses, and the local leaders would not keep horses if there were not a prospect of having wood to carry each winter.

1064. What is the average distance of the woods from the railway station? Give it approximately—I do not mean exactly?—The distances are from two to six miles.

1065. So that you may say that the station is an average of 3½ miles distance?—Yes; that would mean one big load once a day.

1066. (*Dr. Somerville.*) In your experience of steam traction, do you ever haul on the public roads?—Yes. I have not hauled the timber of full length, but jukst for our own use. It is cut into lengths and put into he traction waggons. The trunks are not hauled by us as they are felled, that is, to the station.

1067. You have not used the public roads with your steam engines?—Yes, we have, but we have had the timber cut into short lengths.

1068. Still you never get far from your own property with your engines?—No, it is all on the property.

1069. You find that the Local Authorities impose no troubles and restrictions?—They have not done so; there has been no occasion. They have tried to extract payments from timber merchants on the ground that their traffic was extraordinary, but have failed.

1070. But is it not a fact that where steam haulage on roads is introduced that the owners of these engines are sometimes rather handicapped by having the bridges scheduled as weak, so that they are prevented going over certain districts?—Yes.

1071. You say you have gained a great advantage by the use of steam for haulage compared with horses?—Yes.

1072. I suppose you never haul to the station for the purchasers?—Never.

1073. But if it is an advantage for you to haul your timber on the estate by steam, surely it would be to the advantage of the purchaser to haul timber to the station by steam?—Yes.

1074. They do not do so possibly because they might be restrained; is that so?—I do not think that is the reason. I do not think many timber merchants have traction engines yet.

1075. But as a matter of business you never tried to sell your timber delivered at the station, using your own steam haulage? — I never have advocated that, chiefly because I have employed about 80 men, and I have as much work to do as I can manage without that. Besides, it is impossible for a single forester to look after several departments efficiently.

1076. You are an examiner for the English Arboricultural Society, I believe?—Yes.

1077. You examine in the principles and practice of forestry, and you have done so ever since examinations were started, I believe?—Yes.

1078. Do you believe there is a demand for education in forestry?—Yes, I do.

1079. And you believe there is a demand for qualifying certificates as obtained through the agency of the examination?—Yes.

1080. You have no doubt made up your mind as to how practical forestry schools for the training of foresters who have aspirations to get into the higher practice of the work should be conducted? Do you think young English foresters can afford to pay fees for the education they can obtain in technical schools of forestry?—Not many foresters could pay fees for their sons.

1081. How do you think the fee difficulty could be got over?—I should like to see an experimental area of forest ground laid out where the young man could go for a year or two years in addition to his ordinary run of work. He might go for a year or two years to an area of that sort where he might perhaps only receive a small wage, but which would be sufficient to keep him while he was learning.

1082. You mean putting in work at the same time?—Yes, getting as much pay as would keep him in neces-

saries, and at the same time learning what would enable him to become a forester.

1083. For about two years he would be satisfied if he could get a sufficient wage to maintain him?—I think so.

1084. That is to say, if he were getting his education at the same time?—Yes, I think so, decidedly.

1085. You think that this Forestry School should be in connection with an area of forest land?—Certainly I do.

1086. You took part in the excursion to Germany, I believe?—Yes.

1087. And I suppose the excursion, among other things, enabled you at once to understand what was meant by the writers on forestry when they discussed details of management. Previously you had some difficulty in realising that, but when you saw the thing before your eyes you understood what it meant?—Yes.

1088. Do not you think that it must be difficult for an English forester to go to Germany to see what you have seen? Is it possible for them to see in their own country what you had to go abroad and see?—Of course in the course of time it could be made possible.

1089. You think an area of land which was managed in such a way as to illustrate certain principles and systems would have a distinct educational value?—That is the very thing, I think.

1090. Not only would this area suffice as a training ground for men who would work while they were having their education, but you think land agents and landowners might occasionally visit such an area and see it themselves?—Yes, I know personally many land agents who would.

1091. You think the Arboricultural Society would visit these areas, and that their members would receive due object-lessons which would be of use to them in their works?—Yes.

1092. You speak of the very high quality of the ash in Lincolnshire. Would you put the ash along with the larch as a tree which began to give a profitable return at an early age?—No, sir. I think the larch would pay a larger sum earlier than the ash would do. But in some of the woods larch was formerly mixed with ash. The larch was taken out many years ago, and there is a heavy crop of first-rate timber left. That was when there was a boom in larch for railway work.

1093. Do you say that ash thinnings at the age of 30 years were easily marketable?—Yes, easily marketable. We could make 1s. a foot for such ash. Small ash sells better than anything, even better than small larch.

1094. In your experience has it ever been possible to use netting as a precaution against rabbits twice over?—I have done so this winter.

1095. You have had it, I suppose, 10 or 12 years, and then moved it to a separate wood?—Yes. It has been in use 8 or 10 years, and then it was turned upside down; that is the best way. But it has had a strand wire running along the top, which has been a great protection. It has not been broken down, as it was tied to the strand at every 3ft. or so.

1096. You do not believe in forests being debited with the whole expense of fencing, I suppose?—No, I do not think there is any reason in that.

1097. Perhaps you think half is the proper proportion?—Yes.

1098. Do not you think there is a tendency on the part of landowners to load their woods with expenses, so as to keep down the rateability?—I have not had experience of that, and I do not think so. What I have seen has been a matter of book-keeping.

1099. There is a tendency to load woodlands with debts which do not belong to them?—Yes, it is easier.

1100. You have cited excessive fencing?—Yes, and hunting and shooting tracks.

1101. I suppose in many cases the accountant forgets to credit the woods with the shooting rent?—It has never been so credited in my experience.

1102. I suppose you regard your woods as worth a 1s. or 2s. an acre for shooting?—Yes.

1103. But the accountant forgets to credit that; it may be that 20 per cent. of the total annual income is from this source?—In some cases they do not even put that on the timber.

1104. If there is a shoot on the landowners take away the inferior workmen and use them for beaters, do they, and you get credit for that?—Yes, we get credit where we can.

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1105. You say that you are under the impression that woods are often rather highly rated. Had any case occurred to you where you think woods should be cleared of rates altogether?—Yes. I think that when planting a large area it would tend to encourage planting if these lands were free from rating for a few years.

1106. I suppose woods are often planted for shelter, and not from the point of view of timber at all?—Yes, that is so.

1107. Have you any experience of planting woods for shelter belts?—Yes, but not exclusively. Around farmhouses I have planted several such belts.

1108. And you think the creation of shelter belts improves the land?—Yes.

1109. So you would not think I was exaggerating if I suggested that the creation of 5 acres of shelter belt would raise the value of 20 acres of land 1s. per acre per annum?—That would not be overstating it.

1110. If shelter belts are created to raise the agricultural value of the land in the neighbourhood, the improved value as far as rating is concerned comes into force as regards improvement of the rates?—I do not follow you.

1111. If you improve the agricultural value of the land by the creation of shelter belts, of course the rating authority lays an increased assessment on the land on account of its being improved agriculturally, and that improvement has been effected by the woods. Would it be fair, do you think, to secure an increase of the rates from the improvement of agricultural value, and at the same time to rate the 5 acres of woodland which have been created for shelter purposes also?—It would be very unfair.

1112. Does it not look as if the shelter belt should not be rated because the rates fall upon the improved agricultural value?—Yes, I should think so, but I had not thought of that point before.

1113. There is one other point which has not been mentioned so far. The coppice is not so valuable as it used to be?—No.

1114. There is a tendency to convert coppice into high forest?—Yes.

1115. Have you ever known any profitable result from the creation of such forests from coppices?—I know some in process of being done, but I do not think the matter is sufficiently advanced to enable me to say whether it would be profitable.

1116. You think it would be necessary to clear off the coppice and plant straight off?—I think it would be better to clear all the coppice off. That would pay better in the long run.

1117. (*Chairman.*) You think a regular supply of home timber would strengthen the home market, facilitate the transport, and help to get better prices for timber?—Yes.

1118. And, so far, you think the regular laying out of woodlands on forest plans would promote that end?—Yes.

1119. Have you had any experience in natural regeneration in Lincolnshire or Yorkshire?—I have had one this winter in Lincolnshire. It happened in this way, and although accidentally done, yet the result was similar to what I saw being obtained by artificial means in the beech woods of North Germany. On a twelve-acre plot the timber was sold standing in November, 1900, and during the ensuing winter the purchaser felled and dragged out all the trees, leaving only the beech, which then stood thinly on the ground. Now in 1900 there was an extraordinary crop of beech mast in North Lincolnshire, and the stirring of the soil caused by the horses dragging out the other timber covered most of the mast. The beech trees were gradually felled during the summer and autumn of 1901, so the young beech plants had the advantage of their shade during the hottest part of the year. Seedlings came up in thousands, and if the ground had been my own I should have wired round the plot, and trusted for a crop to the natural-grown seedlings. However, I did not risk that, and so during the winter of 1901-2 I had the ground planted with trees 4ft. apart, not, of course, using many hardwoods. I have

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never before seen such a fine crop of naturally-grown seedlings in England.

1120. There is no difficulty in keeping down the ground game?—Yes there is, if you go in for the extensive preservation of pheasants.

1121. There has never been any system of natural regeneration on the properties that you have been connection with, has there?—No, not natural regeneration. But in some of these woods at Brocklesby, according to Lord Yarborough's private book, I see that certain areas which are now giving good crops were sown with seeds to begin with. Acorns were sown in many places. Of course, I cannot say whether they were filled up with trees afterwards. But the seed was sown to begin with.

1122. Do you think that the return that you spoke of with Lord Yarborough's sanction would be of any use to this inquiry if there were time to prepare it?—I think it would, sir, and I think if the Committee were to approach his Lordship directly there would be no difficulty in getting it. In fact, he said as much to me, but I would rather it came from the Committee.

1123. I will only question you with regard to the employment of foresters. Are there any openings for good men to superintend, each of them looking after several small estates?—Do you mean for one man to superintend several estates?

1124. Yes?—My father did a good deal of that in Northumberland and Durham, but I do not know of any other case.

1125. There should be no difficulty in the way, I suppose. If the owners of small estates were interested in forestry, why should not several small estates be managed by one man. That, I take it, would provide another opening for trained foresters?—Yes.

1126. Do you think the present standard of foresters' salaries is sufficiently high to attract good men into the profession?—Except on a few big estates, I do not think it is. A forester has to know so much, indeed has to know a little about everything on the estate, that the salary is not sufficient to attract him.

1127. Is there anything else of which you have knowledge which would interest us, and which you wish to mention?—No, sir.

1128. (*Dr. Schlich.*) You said you had sown acorns on one or two occasions?—Yes.

1129. In what way?—In lines, but only on a small area.

1130. What is the result?—They are doing splendidly, better than those we planted.

1131. You expect to get better trees from the acorns than from those which you planted?—I think so; they appear to be straighter. They are now about 16 years of age.

1132. I mention that because I have often advanced the view that most of the old oaks in this country were not planted, but were the result of sowing?—I follow.

1133. Do you find any trouble about the seeds from game?—I do. I have tried every precaution. I have put them in paraffin oil and red lead, and then they have been taken by the mice and pheasants.

1134. (*Colonel Bailey.*) You say that this was only a small area which was sown with acorns?—Yes, only a few long rows.

1135. How far were the rows apart?—Eight feet.

1136. And how close together did the oaks come up?—I sowed them very thick in trenches one foot wide.

1137. They came up very thick in the rows?—Yes.

1138. Were rabbits getting in?—No, there was wire netting around the area.

1139. Have you seen any difference in the frequency of attack from rabbits on planted trees as compared with those sown?—Yes, the rabbits are more keen on the planted plants.

1140. When the plants are put out several feet apart you think that the rabbits go for them more than they would if there were masses of them on the ground?—Yes; and if I may say so, I heard an old woodman say—and I attach a very great deal of importance to what is said and observed by born woodmen, woodmen who have been born and trained amongst the woods—that he thought rabbits were what he called more "wood-keen" than they used to be.

Mr. A. C. Forbes.

Mr. A. C. FORBES, called; and Examined.

1141. (*Chairman.*) You are Forester at Longleat?—Yes.

1142. And you have had some experience of technical training in forestry?—Yes, I have had a little.

1143. You obtained some training in Germany?—Yes, and also under Dr. Somerville in Edinburgh.

1144. I believe you were at Eberswalde?—Yes, I was there four months.

1145. Did you derive much benefit from your technical training?—Personally I derived a great deal of benefit.

1146. Do you find many others keen to get this training?—No, I do not think so, because under present conditions it is just a risk whether they get any benefit from it.

1147. You mean there are not enough good appointments?—No, the appointments are there, but it does not follow that the best men get them.

1148. Can you suggest any method by which it would be made easier for landowners to select good men either by diplomas or in any other way?—The best plan would be to get young men working on good estates recommended by their employers. I do not think that diplomas have much influence in determining the selection of a man at present.

1149. On the whole, do you think that amongst foresters there is a keen desire for better opportunities for training in this country?—Yes, amongst foresters themselves I think there is, those who take an interest in their work. Those who simply work for the sake of what they can get out of it do not care very much about it.

1150. You think there is a lack of interest amongst owners and agents as regards having the opportunity of selecting from a number of good foresters?—I think a man is selected on his practical knowledge or experience more than on his technical knowledge.

1151. Do you attach more importance, in connection with the training that you have had, to the object lessons that you saw at Eberswalde, or to the theoretical training that you obtained?—I attach more importance to the object lessons, decidedly. Of course, I was handicapped in the matter of the language; I did not understand the language sufficiently well to take full advantage of the lectures. I did not go there with the express purpose of taking the lectures, but rather to see what was going on.

1152. Do you think that what is most required here is an area for demonstration?—Yes, we have plenty of areas, but the difficulty is——

1153. I mean a State area for demonstrating, showing how trees can be best grown, and how their products can be best utilised?—That is a very difficult question, because there are so very few woodlands on an estate which are managed as a separate portion of the estate. The woodland department is very likely mixed up with the general department.

1154. But if you had a State forest or a model forest where training was given in growing timber, thinning timber, pruning, felling, putting it on the market, and manufacturing it, and giving training to men for all the different branches of forestry or manufacturing, that would cover all the ground?—Not all the requirements, I think.

1155. What would be left out?—The working of a residential estate; you would require experience in that, because that forms a great deal of the forester's duty nowadays.

1156. Gardener's work?—No, not exactly gardener's work, but in a model forest you would not get many branches of work that you have to do on a residential estate.

1157. You would get all that practical work?—Yes.

1158. I do not suppose you would want to stay there more than a couple of years, or a year, in your training, or perhaps even less?—On the residential estate?

1159. No. If you were taking your training in a State school or in a State forest area it would be like

a short engagement; you would not spend the greater part of your life there?—No, not more than two years.

1160. You would have abundant opportunity in the other places where you obtained employment to collect that part of your knowledge dealing with an ornamental garden?—Yes.

1161. I see that you have dealt in your statement (*Appendix VIII.*) at some length with the question of an advance of loans to land owners by the Government, and you think that security can be given in the form of middle aged or nearly matured woodland, the loan to be expended on planting or other approved forestry work. At present timber is not a mortgageable form of property, is it?—No, I think not

1162. Therefore you may have an estate with £5,000 a year of agricultural land which can be mortgaged up to the hilt, but you might have an equal value in timber on the same estate which you could not mortgage at all. I suppose you would make it mortgageable like the agricultural land?—I should not burden the estate; you must not burden the estate.

1163. You would burden the timber?—Yes.

1164. To do that you would have to put it under a regular plan; you would have to insure it against fire, and so on?—With a mature crop there would be very little risk of fire.

1165. Yes, if it was all of one age, but you would only insure the mature crop?—Yes, or the nearly mature crop.

1166. You would have to make some provision against gales by means of shelter belts?—In the case of gales the timber would not be blown away; you would have the value of it.

1167. Not necessarily; you would not have the value of it. Do not you get something less than the value of it after a gale?—Yes, if you have a large quantity, but not as a general rule.

1168. You would not be able to mortgage very small lots of wood?—We should not mortgage it to the full value.

1169. At any rate it would have to be under a regular plan?—Yes.

1170. And be felled at the proper time?—Not necessarily. If the mortgagee liked to pay off the loan by other means he could do so.

1171. You must take it that your loan exists, I am talking of the formation of a loan. You could not have a loan without putting your forest plan in as a schedule to the deed of the loan; it would be the only form of security you would have?—Yes.

1172. You might have to take some security in the case of hard woods, in mature woods, against ground game?—The mature crop would not be damaged by the ground game.

1173. But the partly matured would?—Yes, the three-parts matured is the youngest I should take for the purpose.

1174. You do not think that needs any protection against ground game?—No, none whatever.

1175. You have never seen trees of any size damaged by ground game?—I have seen beech damaged to some extent, but not enough to affect its value within 20 years.

1176. Are you aware that many land owners attach considerable importance to the borrowing capacity of the estates or property?—Yes, but what I think you must do in this case would be to separate the woods from the general estate.

1177. I understand that, but once the land owners found they could borrow money on the security of their growing woods you think it might lead them to attach more importance to that form of property?—It would do away with a good deal of the personal loss.

1178. And it might offer an effective stimulus to the average land owner to place his woods under a regular forest plan?—Yes, I think it might encourage him, at any rate.

1179. And you think, therefore, that perhaps clearing the way to systematising timber mortgages as you suggest might prove to be an effective means of bringing about the methodical management of woodlands?—Yes, I think it might after a number of years; of course it would not come about at once.

1180. You think that a short course of sylviculture and the practical demonstration in woods of the working of forests and woodlands in definite centres is an important matter?—Yes.

1181. Do you attach more importance to giving instruction at convenient centres; or, taking one or more centres (a more limited number), to give a higher quality of instruction?—The high quality of instruction must be left to the man's own initiative, I think. Of course it would be so in any case, but as long as the facilities existed the man could take advantage of them if he chose.

1182. You would have a high course of instruction for a few, and local demonstration for the many?—Yes.

1183. You think that literature is wanted; you suggest a special forestry supplement to the Board of Agriculture Journal. Have you got any good text-book in forestry?—Yes, there are several; Professor Schlich's is the standard on the subject.

1184. I meant for the ordinary working foresters?—No, there is none at all; they would not read them if they had any.

1185. They do not read much?—No, because many of them do not know what forestry means in fact.

1186. (*Dr. Somerville.*) Do you find there is much demand for education amongst foresters in this country?—Amongst themselves I believe there is. I think the man who takes up forestry does so for the love of the thing.

1187. You find, do you, that when once a man has gone a certain length into the study of forestry that it becomes fascinating to him?—Yes, certainly.

1188. And, in fact, although the rate of remuneration is not very high, possibly there is an attraction in the profession beyond what can be gauged by a mere money return?—In my own case there is, although I cannot say it is so for everyone; but I think the majority of us feel that.

1189. Do you think that a highly trained forester would have a fairly free hand to manage the woods that are put under his charge?—Not under present conditions, I think.

1190. Do you think as a general rule the forester has to take his orders from somebody else?—Yes.

1191. I suppose that somebody else is the agent?—Yes, probably the agent.

1192. Or the landlord?—Yes.

1193. I suppose it is quite reasonable that if the landlord takes an interest in his woods, and especially if he also has knowledge of the woods, that he should take over the general supervision of the woods on his estates?—He should do so.

1194. And you would not, in point of fact, as a forester yourself, object to being generally advised by either the landowner or the agent, if these men spoke from knowledge?—No, not at all.

1195. But I suppose you find in many cases neither the one nor the other has any sound idea of the principles of good sylviculture?—Very few of them.

1196. Do you think that the condition of things in this country would be improved if facilities for educating these two classes were provided?—I think a great many who take an interest in them would be benefited by such means, but of course those who take no interest whatever would not.

1197. You have handed in a fairly exhaustive statement of your suggestion as regards State loans for forest purposes: is this evolved from your own experience, or from your own consciousness; or is it based upon any system that is at present in vogue in any country in Europe?—It is not in vogue as far as I know.

1198. It is what you would call a set of original suggestions?—Yes.

1199. Are you acquainted with the conditions that at present prevail with regard to the State lending money for forestry purposes?—Only under the Land Improvement Acts, that is all.

1200. You know how the money is obtained in that case?—Yes.

1201. You know, I suppose, that the money is paid over on the certificate of an inspector?—Yes, for the work done.

1202. When the work is done the money is paid?—Yes.

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1203. And it does not matter a fraction what takes place to the woods afterwards, that is to say, there is no control exercised over the wood that is created with that money?—No.

1204. Would you consider that an estate was at all benefited by an expenditure of £500 upon young plantations if the young trees were largely destroyed by rabbits within the next year or two after the creation of those woods?—No, none whatever.

1205. Do not you think that under the present system the estate is not protected or the heirs of the estate are not protected as regards the expenditure that may be laid out from the Government sources?—No, I think it often amounts to a burden on the estate.

1206. You, in other words, would be inclined to recommend that inspection should go on concurrently with State loans?—Yes.

1207. Do you think that landowners would take advantage of the credit of the State in connection with the extension of forestry?—I think they would in many cases.

1208. I see that you would make growing timber the security for the repayment of the loan?—Yes.

1209. And you would have the loan repaid within a reasonable time?—Yes, within 30 years.

1210. You would not, in fact, burden the rest of the estate with the loan, but you would burden the timber crop on the estate?—Yes, the timber crop; I would not touch the rest of the estate in any way.

1211. (*Mr. Marshall.*) I see under heading 3 of your statement you refer to the formation of Government forests in rural districts containing less than 5 per cent. of woodland, acquired by purchase or borrowed from the landowner, rent free by an arrangement with the owners. Why with less than 5 per cent. of woodland? There might be 95 per cent. of land absolutely suitable for plantations in one part of the country, but in other parts you might have land of such high agricultural value that it would be useless to plant on it. Why do you specify that you would only form Government forests with that proviso?—I have explained that afterwards. I do not refer to big manufacturing districts of high value; I am talking of a purely agricultural district.

1212. You would advocate the formation of Government forests in districts where there is not already 5 per cent. of the acreage under woodland, and where the agricultural value of the land was not too high?—Yes, that is so.

1213. Land is supposed to be acquired by purchase or borrowed from the landowner, but you could not form a Government forest on land borrowed from the landowner. How do you explain that?—I give him the option, if he wants the land back again, of buying the property back at its cost value. I explain that later on.

1214. (*Colonel Bailey.*) I see in the statement which you have laid before the Committee you have named a large number of faults that you found with the present system of management. For example, you say that the absence of a definite rotation causes great financial loss. The different age classes are rarely represented in proper proportion; there is a variation in the amount of the growing stock of timber from year to year, caused both by the felling and the deterioration of matured timber; that early thinnings made to encourage herbage and surface growths for game tend to produce timber of poor quality and diminished height growth; a large proportion of the crop is often harvested before it is matured or it is allowed to stand after reaching maturity; there is an excessive proportion of branch and brushwood to saleable timber, and consequently a diminished yield of timber, and so forth. You also say that there is a general lack of organisation in all branches of wood management. These are the principal faults that you find with the existing wood management?—Yes.

1215. Do you think those faults are widely spread in the country?—They are almost universal.

1216. Do you think the fact that those faults are almost universal is widely recognised, or is its recognition confined to yourself and a few others?—It is recognised amongst foresters, but I do not think it is recognised by many landowners.

1217. You think it is generally recognised amongst foresters?—Yes.

1218. Do you think that the foresters who generally recognise this are desirous of putting themselves in a position to improve matters?—Yes, I think they are.

1219. But you said just now that if a text book were put into their hands they would not read it?—I was not talking then of foresters. I was talking about the men whom I am suggesting should benefit by these short courses of lectures, the woodmen, not the managing foresters.

1220. It is the woodmen who would not read?—Yes, not the managing foresters.

1221. You think there is a widespread desire amongst managing foresters to improve their technical education, so as to enable them to avoid the faults that you have detailed?—Yes, I think so.

1222. How do you think that could best be done: how do you think this training could best be arranged for?—The first stages of the education I think should take place in the woods.

1223. In what woods?—In the estate woods, the best that could be found in the district.

1224. Private estates?—Yes.

1225. Do you think that the woods of a private estate could be managed continuously so as to produce the best results?—They might.

1226. In view of changes of ownership, changes of foresters, and changes of agents, do you think that the woods of any private estate are certain to be brought to maturity in the best possible form and under the best possible conditions?—There is no certainty about it.

1227. Does that seem to point to the necessity for a State area for instructional purposes?—Yes, it points to the necessity, but you must recollect that we have groups and woodlands in all our estates which are almost perfect specimens of sylviculture.

1228. You may have the groups, but they have arisen in a rather haphazard fashion. You cannot rely upon producing these groups, I suppose, with that regularity and in that condition in which you want to show them for educational purposes. Does not it seem necessary, therefore, that there should be a State area on which work can be done systematically, and results suitable for instruction ensured?—It would be a very great advantage.

1229. I see that in one part of your memorandum you suggest the formation of Government forests in districts with a small proportion of woodland. Had you any idea of education in that?—No, I had no idea of education in connection with that; it was simply a question of economics. It might take the form of an educational forest, a model forest for the district with regard to species and management.

1230. Do not you think that if you were establishing State forests for educational purposes, they would be more necessary in well-wooded districts than in districts bare of woods?—Yes, for educational purposes alone.

1231. I see you mention that another fault in the present management is the hesitation shown by proprietors in the clearing and replanting the old woodland. What do you mean by that?—They would rather keep 20 trees to the acre than clear the ground right off and replant it.

1232. What is the reason of that feeling?—It is a sentimental reason in many cases. Another reason is that so long as a few trees stand to the acre they are available as game cover, and many owners value woods as game cover only; they do not take the trouble to replant them.

1233. Is it not the fact that in a large number of the woods which are kept more or less for profit, or for profit alone, the crop is allowed to stand long after the time that it ought to be taken away, so that in the condition in which you now find it, the wood is growing little or nothing per acre per year?—That is so in many cases.

1234. Do you think that is due to a general ignorance of the value of well-stocked woods—want of realisation of the value that the woods might have if they were properly managed?—No, I do not think so. I think it is due more to the fact that the owner for the time being thinks that he loses and nobody else in particular gains by taking down an old crop and replanting a new one. The chance of profit from a new crop replacing an old one is so remote that he hesitates very long before taking what to him seems a heroic step.

1235. (*Dr. Schlich.*) I see you advocate the appointment of a Standing Committee of Forestry by the Board of Agriculture with a staff of consulting experts, and you enumerate a number of the things that this Standing Committee is to deal with. Amongst others you have mentioned the collection of data and statistics relating to British forestry, the home timber trade, the organisation of experiments and investigations in practical forestry?—Yes.

1236. We have already heard something about the first part of these, but I should like particularly to refer to the experiments and investigations in practical sylviculture. You have already told us that you think these experiments and investigations in practical forestry might be organised in conjunction with estate foresters?—Yes.

1237. And the results published from time to time?—Yes.

1238. What sorts of experiments and investigations do you refer to?—The growth of trees on different soils and in different places as forest trees, and not as ornamental trees.

1239. You would make investigations with regard to the selection of species for a particular locality?—Yes.

1240. And then watch the progress of the development of the wood?—Yes.

1241. You would ascertain the amount of timber that it would produce at certain stages?—Yes.

1242. And you would also make experiments with regard to the proper degree of thinning, having a particular object in view?—Yes.

1243. In other words, do I understand you to suggest that a collection of data should be made by degrees, which are to be put together as on the Continent, and incorporated into yield tables?—Yes, that would be one branch of the subject.

1244. In fact, tables which indicate the development of woods in different localities, and the development of different species, etc.?—Yes.

1245. Do you consider a collection of such information of first-rate importance?—Yes, I do.

1246. In other words, you think we should be all the better in devising the system of management of the woods of this country if we had such tables referring to this country?—Yes, certainly.

1247. And that it would simplify in many respects the management, and enable the forester, or whoever is the manager, to decide with much less doubt what is the best method of treatment to apply?—Yes.

1248. In connection with State forests, I believe you have been to Germany, and probably also to France, and seen the State forests there?—Yes.

1249. You have seen enough to know that the experiments extend over a considerable period of time?—Yes.

1250. You know they cannot be done in a year, or 5 years, or many of the experiments in 10 or 15 years; that you must continue them in order to get data which are worth having?—Yes.

1251. Do not you think if you do that in estate forests that you run a considerable amount of risk? After having bestowed a great deal of trouble, labour, and money on the question, may it not all of a sudden come to an end and be knocked on the head by the proprietor changing his mind, or by his dying and by his being succeeded by a son who takes no interest in the subject, and starts cutting down the timber because he wants the money? Do you think it is a safe and wise thing to adopt such a plan in ordinary estate forests?—I think so, to a limited extent, in short rotations.

1252. What do you call a short rotation?—In 30 years.

1253. Of what?—Pit wood, larch, and similar species.

1254. Do not you think there are a great many other methods of treatment on which it is much more important to get reliable data than on that of pit wood, which is exceedingly simple? For example, if you grow trees which are worked under a rotation of 80, or 100, or 160 years, like oak? Do not you think it would be much more sensible to take the bull by the horns, and say we must have State forests for that?—Yes, much more sensible, but if you cannot get State forests you must put up with the other.

1255. I do not know that you cannot get State forests: we have a great deal of State forest at present in this country—between 60,000 and 100,000 acres. After all, the war in South Africa is not going to last for ever, and we might buy some additional areas when they are required?—That is the only way.

1256. You see the point I am coming to is that you propose to do this in connection with estate forests. I say it is a very risky operation to do that in connection with private forests?—Yes, it is risky.

1257. You admit that?—Yes.

1258. And it would be better to do it at once in forests owned by the State or by large Corporations?—Yes, certainly.

1260. That it is a very desirable thing that these experiments should be started as soon as possible in estates in which it is assured that they will remain under rational management for a considerable period?—Yes.

1261. That is the point I wanted to bring out. You have also seen enough on the Continent to know that these forests would be eminently adapted for the instruction of students where the experiments were going on?—Yes.

1262. Have you been in Chorin or Freienwalde, near Eberswalde?—Yes, I have been in both those places.

1263. You are aware that those two things are always combined there? You make your experiments, and at the same time they are the most valuable objects of instruction to the students?—Yes.

1264. You have seen enough to know that they can be carried on alongside of each other?—Yes.

1265. You thus kill two birds with one stone?—Yes.

1266. (*Professor Campbell.*) You have had considerable technical as well as practical training in forestry, I believe.—Yes.

1267. How long did you spend in learning technical forestry?—I was learning it twelve months.

1268. Had you a training in practical forestry before that?—Yes.

1269. How long?—I was two years working in the woods, but before then I had a good deal of training in general estate work.

1270. Then you proceeded to a school of forestry, I believe?—Yes, I then went to Edinburgh.

1271. What subjects did you study there?—Forestry, botany, chemistry. I took the agricultural course as well.

1272. Was the whole agricultural course necessary for your training as a forester?—No, I took it so as to make the most of the time there.

1273. You ought to be in a very good position to say what would be a good course for training a forester in technical matters. If you had your time to go over again what subjects would you take up?—My first step would be the practical training. I think he should have that training until he was 18 or 20 years of age, and until his mind was fixed on the subject. Then I think he should take one or two years of technical training, including courses of botany, chemistry, and so on, and sylviculture, which you might term technical. Then he could go into the woods again as foreman or improver.

1274. And if you had the advantage of a State forest where forestry could be learned, would you advise going there before entering for the course, or after?—Before.

1275. Do you consider all these subjects which you have mentioned necessary for a forester?—No, not absolutely necessary; but I think botany and chemistry are necessary.

1276. You yourself have derived a great deal of good from having studied these subjects?—Yes.

1277. And you would be in favour of giving a course of chemistry and botany to all?—Certainly those two subjects, and field engineering, and such things as that.

1278. Would you confine that to estate managers?—No; I do not think it should be confined to estate managers, because much of it comes into a forester's duties.

1279. I see that in your memorandum you recommend a staff of sub-inspectors to inspect land on which planting by the Government is contemplated or suggested. And I read somewhere else in your memorandum that you advised the same thing in respect to landowners who are contemplating planting?—Yes.

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1280. Do you think landowners would take advantage of that?—Many of them would, those who take an interest in the matter.

1281. Do you think foresters as a rule would be willing to call in the services of an expert?—Yes, many of them would, I think.

1282. And that would be a very great advantage?—Yes.

1283. Would not that do away with much of the waste which is going on at the present time owing to wrong methods of planting?—Yes, in connection with planting wrong species.

1284. And in respect of different methods of planting as well?—Yes.

1285. Do you think the forester would continue to carry out the instructions of the expert if he visited two or three times a year?—Yes, if he saw the advice was justified.

1286. Do you know of any cases where the expert has been called in and great advantage has accrued to the forest in consequence?—I believe that on the Duke of Bedford's estate Professor Schlich has been called in; but as a general rule it is not customary to call in anybody. The local man in charge is supposed to know everything.

1287. The forester?—Yes.

1288. Your experience is that he does not know?—He does not in all cases.

1289. (*Mr. Stafford Howard.*) In your opinion the condition of the forests in this country is very bad, and the management of woods is not what it might be, and there is room for great improvement?—Yes.

1290. You agree, I suppose, that one of the most important things is to interest landowners in the matter, and to get them to bring about some improvement in their own estates?—Yes.

1291. The suggestion which you have made about this Standing Committee, which is to get together facts and information and publish it, is with the view of enlightening people, and showing them what might be done to some extent?—Yes.

1292. Do you think it would be possible to show landowners that financially they can make a better thing out of their woods than now?—You could show them, but I do not know whether they would act upon it.

1293. You could show them by experience of certain well-managed woods how the same thing could be done elsewhere, and without sacrificing sporting?—You must put up with the sporting in all British forestry operations; you must regard that as a necessary evil.

1294. Could they improve the financial result of their woods without limiting or sacrificing their sport?—Yes.

1295. Do you include rabbits in that statement?—No: I exclude rabbits.

1296. You think we must exclude rabbits?—Yes, but even with rabbits I think it is possible to improve the condition of English woods by a system of clear felling.

1297. Could you improve them so as to make it pay?—Yes, you could; but you would have less profit if you kept rabbits.

1298. And you think that a State forest for the purpose of making experiments and demonstrating and instructing would be very useful?—Yes.

1299. And if there were such a forest for the purposes of making experiments and demonstrating, so that a certain number of practical working woodmen could go, and young men could be apprenticed there, it would be a very good way for them to begin, you think?—Yes.

1300. If there were a school on the spot they could take advantage of some of the lectures?—Yes.

1301. If there had been such an establishment as that, would you have gone to it yourself?—Yes, certainly.

1302. Meanwhile you think there might be an advantage if landowners would combine in having local lectures, and taking advantage of cases where good woods are to be found, for the purposes of demonstration?—Yes, there is a very great loss owing to the lack of knowledge on the part of the woodman.

1303. If those things were organised, do you think that many would take advantage of them?—I do not think the older generation would, but I think the young men who aspire to something better would.

1304. Do you know of any instance where something of that kind has been done?—No.

1305. I think Colonel Bailey told us of some case in Scotland where he had been asked to lecture?

(*Colonel Bailey.*) Yes, that was by arrangement with the landowners. One of the landowners was the Chairman of the County Council of Aberdeenshire, and I think it was really through his instrumentality that that course of lectures was asked for.

1306. (*Mr. Stafford Howard.*) If in your neighbourhood there were a course of lectures, and men had leave to go, do you think you would be able to demonstrate what you lectured upon?—Yes; we have 10,000 acres of wood, on adjoining estates.

1307. Do you think there is plenty there to show all it was needed to show?—For that district it would be sufficient material. For instance, on the Chiltern Hills beech woods are managed on a different system.

1308. So you could not show everything?—No, but we could show specimens of everything in that district.

1309. Therefore you think if landowners formed forestry associations, as they have formed agricultural associations, they might themselves start experimental stations?—Yes.

1310. But there would be a risk, as Dr. Schlich has pointed out, owing to the landed proprietor changing his mind and not wishing to have it any more. But still, I take it it would be a good thing if they did that?—Yes.

1311. (*Colonel Bailey.*) I suppose that in order to carry out such experiments you would require an expert?—The experiments should be arranged according to the facilities for carrying them out. They are not bound to be of any special form. In the district I am living in now we have a large area of oak woods which are growing on land which is not adapted for oak at all. It is a cold clay land, and oak will not grow on it. I think coniferous trees would do better on that land than oak.

1312. (*Chairman.*) When were they planted?—100 years ago, I think; at any rate, not much less.

1313. And they are doing no good?—None whatever. There is land in parts of the New Forest in the same condition.

1314. (*Dr. Schlich.*) Are you a head forester?—I am a head forester.

1315. I know you are one of the most successful head foresters in this country, and I take it that you are decidedly of opinion that young men who want to qualify themselves for positions of forester or head forester should begin with practical work on the estate?—Yes.

1316. And that there should be superadded thereto instruction afterwards?—Yes.

1317. If they can have it?—Yes.

1318. But you attribute great importance to their beginning practical work under an estate forester?—Yes.

1319. Supposing you had been told that the work should be done in a garden instead of on an estate, would that be the same thing?—No, it would not be quite the same thing.

1320. Why?—Because a man must begin under the conditions in which he is going to live, I think.

1321. You would not consider it equivalent at all for the man to work in a botanical garden, even if there were a small arboretum added to it?—Not at the commencement of the training.

1322. You want him to go into an actual forest estate?—Yes.

1323. And, of course, there is one thing more required; do you not think it is of the highest importance that he should go to an estate which is managed by a thoroughly competent manager or head forester?—He would be all the better for it, but at that stage of his training I do not think the management of the woods would be very much affected.

1324. It is important that the men who want to save time and get on rapidly should work under a thoroughly competent estate forester?—If they want to save time they might, but a boy beginning at 15 would not be able, for two or three years, to discriminate between good management and bad.

1325. He would be simply a labourer who would be working in a mechanical way?—Yes.

1326. I should have thought you would have agreed that it was of great importance that the man should do practical work before he goes to a school where he can learn forestry, and that he should work under a thoroughly competent forester?—He would be all the better for it, but it may not be available in his district.

1327. I want you to tell me whether you think it of importance that he should work under a thoroughly competent forester?—Yes, certainly it is of importance.

1328. And that the more competent foresters we have to instruct them the better?—Yes.

1329. (*Chairman.*) I gather from your interesting statement that forestry pays well at Longleat?—It pays very well.

1330. You give one example of larch putting on 100 feet an acre a year up to 30 years of age?—Yes.

1331. And I suppose it would go on after that?—Not at that rate.

1332. Yes, but it would be of considerable value even later?—Yes, in our district larch at 40 years gives the best return.

1333. And even at 30 years of age a good deal of the larch timber which you felled would bring in 1s. a foot?—Yes, more than 1s. a foot in some cases.

1334. And that would work out at a very large annual rental on the land?—The net rental would be 30s. to £2 an acre on a 50-year rotation. I have not given a rotation of 50 years in my statement. I do not think you get an average yield of more than 80 feet per acre on a 50-year rotation under favourable conditions.

1335. Your Douglas fir gives an extraordinary return up to 20 years of age?—We have no crops older than that at that particular place.

1336. You think that counties might do something for demonstration in this subject?—Yes, I think so, technical instruction.

1337. Did you see Dr. Somerville's sections in Northumberland, at the County Council farm there?—No, I have not seen them.

1338. One could not anticipate County Councils raising very much by way of rates for forestry purposes?—I think where rates were chiefly drawn from large landowners it might be done.

1339. But landowners themselves show very much indifference on the subject of forestry?—Yes.

1340. And in a country where the education rate is rather low there would probably not be very generous grants for forestry?—No, sir.

1341. You have no objection, as I gathered from what was brought out by Dr. Schlich, to State forests, but you look upon them as the best system?—Yes, certainly.

1342. And you suggest a method of progress supposing a State forest cannot be established?—Yes.

1343. But you believe in State afforestation if you can get the land?—Yes, but I think you might find a difficulty where the desired area is split up among different landowners.

1344. You want to have land in large blocks?—Yes.

1345. And they would have to be better tended than those we have at present?—Yes.

1346. Mr. Lascelles, in the information he gave us in 1887, spoke of the New Forest as being an area of 40,000 acres, which was waste. Do you know the New Forest?—Yes, I am living not very far from it now.

1347. Do you agree with Mr. Lascelles' view?—Yes. I think he might have gone further and said that 60,000 acres—the whole of it—was practically waste until very recently.

1348. And none of the State forests which we have in this country are of the slightest value for educational purposes?—I believe their value rather lies in showing what should not be done than what should be done, from what I have seen of them.

1349. Supposing you had a good system of State forests, with a regularly organised service of foresters, would not that tend very much to raise the status of foresters as a profession in this country?—It would raise a man socially, but I do not know about his position. Of course it might improve that in course of time.

1350. But if he were raised socially he would be better paid, would he not?—It does not follow.

1351. Do you consider there is sufficient remuneration for foresters to attract the best men into the profession?—No, I do not think so. It would not remunerate a man for going to any expenditure on his training.

1352. Can you give examples of extraordinary claims for road traffic which have been successful?—Do you mean any timber merchants I know who have kept traction engines? Yes, they are always having claims made against them.

1353. Do you believe it is a necessary part of the equipment for removal of timber from forests?—Yes, especially in the case of large timber.

1354. Have you any experience of how timber land is affected by tithe, or by local rates, or by Death Duties?—Death Duties are one of the greatest drags on forestry in this country.

1355-6. That is, they are raised on the capital value of 25 years purchase of the unimproved pastoral value?—Yes, and not only that, but I believe they are fatal to all organisation in woods, because for eight or ten years after the death of an owner everything but the very necessary work is suspended on many estates.

1357. But is not the rate on woods lighter than it is on agricultural land, if it is restricted to 25 years purchase of the unimproved pastoral value?—I am speaking now of the working expenses of woods. Those expenses on a death occurring are reduced in order to make up for the heavy death duties, and that very often disorganises the whole working.

1358. So, if a good forest demonstration area is established it should be where the best results can be shown?—The best forestry results, yes.

1359. You advocate the creation of forests where there is sufficient woodland to encourage it?—Yes.

1360. But to have a thoroughly good demonstration area for training purposes, as well as for showing what can be grown, you would choose the best site that can be found for growing timber?—Yes, and which presented the most varied nature of soil.

1361. (*Mr. Stafford Howard.*) You said, in answer to the Chairman, that the greater part of the New Forest was waste?—I think it is bringing in very little return, considering the large extent of ground.

1362. Do you mean that the land is too bad?—No, I do not think it is; I do not think there is anything to bring in the returns from. I am, of course, speaking of the results of administration 100 years or more ago.

1363. Are you not aware that some of the old woods which were planted in the 18th century have been pronounced some of the best that have been seen of pure oak?—Yes; but there is a large area of oak there.

1364. Yes; but part of the trees had to be cut down and others planted?—Yes.

1365. What is your experience of the New Forest?—I have been there half-a-dozen times or so; but I am not well acquainted with it. I know the country generally very well.

1366. (*Chairman.*) Do you think there is much land which would pay to put under timber cultivation?—Yes; in certain districts there is a good deal.

1367. Poor agricultural land as well as waste lands?—Yes, on the sands and gravel especially, but not on the clays.

1368. There is a good deal in the West of England?—There are the greensand and tertiary formations in Hampshire, Dorsetshire, and Somersetshire.

1369. Have you experience of any other part of the country?—I know Bucks very well, and part of Berks.

1370. (*Dr. Somerville.*) Do you know of any improved management of woods in your own recollection?—I think there is improvement in the direction of thinning and selection of species.

1371. Do you think that foresters are beginning to realise that education can do something to improve the returns?—Foresters do realise it, certainly.

1372. When you began to study forestry 12 or 14 years ago it would not have occurred to foresters to treat larch materially differently to other timber in the way now adopted?—No.

1373. They would have expected the same number of trees from one set of circumstances as from another?—Yes.

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1374. That is the outcome of your observation and experience?—Yes.

1375. And, therefore, management which would produce a good result in one case would produce a disastrous result in the other?—Yes.

1376-7. And yet ten years ago that was not recognised?—It was not, generally.

1378. Do you think that larch planting in this country has had a materially deteriorating effect upon sylviculture?—Yes, in districts where planting has been done within the last 100 years.

1379. Do you think the foresters' argument that what has been good for a larch wood has been good for the rest, and that it has been managed far too openly, is the cause of that?—There is no doubt a good deal in that. Of course one of the effects of over-thinning is due to game as much as anything.

1380. But still larch has had some influence?—Yes, I think so.

THIRD DAY.

Thursday, 24th April, 1902.

PRESENT:

Mr. MUNRO-FERGUSON, M.P. (*Chairman*).

Sir JOHN F. L. ROLLESTON, M.P.
Mr. EDWARD STAFFORD HOWARD, C.B.
Professor W. SCHLICH, C.I.E., F.R.S.
Colonel FREDERICK BAILEY, R.E.
Professor JOHN R. CAMPBELL, B.SC.
Mr. JOHN HERBERT LEWIS, M.P.
Mr. GEORGE MARSHALL.
Dr. WILLIAM SOMERVILLE.

Mr. REGINALD H. HOOKER, *Secretary*.

LORD GLANUSK (of Crickhowell, Wales), called; and **Examined.**

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1381. (*Chairman.*) I believe you can give us some information?—I do not quite know what you wish information upon.

1382. We should be very glad to have your evidence on one or two points to which you have alluded in a short summary which the Secretary gave me: for instance, with regard to afforestation in Wales?—All my knowledge has been gained in Breconshire, and Breconshire is divided into three classes of soil; the upper part of the county is Silurian, the central is old red sandstone, and the extreme south is the coal formation. The old red sandstone is by far the best for growing timber, and for every other purpose. Larch planting is a great source of profit amongst the owners of the land, and under favourable conditions it is extremely profitable, but I must limit that to where the conditions are favourable. If it is not too high above the sea, and if you plant a reasonable sized plantation, not less than four acres, it is a profitable transaction. If you have to fence a single acre it costs precisely double in proportion to the fencing of a plantation of four acres. You will see that at once, because in the four acre plantation you omit the inside fence. I do not know whether you follow me in that?

1383. I think we fully understand that matter?—Quite so. Supposing there is no clearing to be done, which would cost 10s. an acre, and supposing there are no rabbits, which are very costly to exclude, even if you can exclude them, I find that a plantation of four acres costs about £39 to fence. Then, of course, the cost of planting depends entirely upon whether you grow your own trees. I give about 3s. 6d. a thousand for my trees, and grow them in a nursery, and when I plant them out at four years old they would cost at the nurseryman's £2 5s. 6d. a thousand, but if you grow them yourself you can grow them at £1 or under, which, of course, makes a vast difference in the profit when you have to wait 45 years for your returns. If you can plant at that, and if you get £46 worth of thinnings in ten years' time, when they are fit for hedge stakes, wattlings of a river, and so on—I make in my four acre plantation £46 after ten years, and after 20 years I get another thinning, which is then what we call pitwood, to support the roof of coal-pits, and I get from these particular plantations £57 10s. worth, and I sold the whole four acres at the end of 45 years for £400. I have calculated that out. If you take 3 per cent. for your money the plantation gives you your 3 per cent. and your capital back again, and you get an annual rent of about 18s. an acre for your plantation. That is a good plantation. If you want 4 per cent. for your money you must have less rent. If you want 5 per cent. you must be content with a still less rental. If you take 4 per cent. you will have 13s. an acre, but if you take 5 per cent. for your money, as I calculate it, your would have 9s. for your acre. If your plantation requires clearing on account of being very rough land, you would have to pay 10s. an acre at the very beginning for that, which would reduce the rent by 1s. 8d. an acre. If you have to try and exclude rabbits that will cost you another 9s. an acre of your rental, and would knock your profit down to very little indeed, to about half the rent at 3 per cent. That is on a plantation 670 feet above the sea, and at that height, and on fairly good land, a larch plantation would be a very valuable thing up to the point I have mentioned. If you take a plantation very much higher above the sea it is different. I did hear at one time that the Government had a kind of idea of afforesting some of the Welsh hills, and as an example I will tell you the results of large plantations upon the mountains. My late grandfather, 50 years ago, planted two considerable pieces of the mountain; one was 24½ acres and the other 32 acres, so that they amounted to something over 56 acres together. The initial expenses of the one cost him £177 and the initial expenses of the other £217—I can give the items if they are desired—which comes to a total of £400 for the lot. We waited 45 years for our profit, and we sold the whole thing for £475. If you take 3 per cent. interest on the original sum and £113 for the up-keep, which is a correctly ascertained figure, it cost altogether £1,600, and as we got £475 for the two plantations it landed us in a loss of £1,130, which on fifty acres of land cannot be called profitable. Then it must be remembered that with regard to the profit I have taken on the lower lying plantations, when you have taken a crop of larch off land you do not leave the land in the same condition that you found it; it is full of larch stumps, and quite unfit for cultivation in any other way except by the re-planting of larch trees. My experience does not extend to a second crop of larch trees, but I do not think they will be anything like so profitable as the first. Unless they were very near a station and could be planted without fencing, and so on, I do not think that the scheme for planting the Welsh hills would land the Government in anything but a very large loss.

1384. Up to what height do you think you could plant profitably in Wales?—If you desire to have it I could give you plantations of different heights. I have some which I hope will be profitable up to 1,800 feet. But the plantation I took, which was a fair plantation, was 670 feet above the sea. I think you might say that you could plant hills a little higher than that, perhaps up

to as high as 1,000 feet. The other two plantations that I gave you run from 1,400 or 1,650 feet above the sea, and I am sure those are likely to be unprofitable.

1385. You would take the margin of a healthy range for the cultivation of profitable plantations as about 1,000 feet?—I think that is quite the outside of it. I have also tried planting the very top of a mountain called the Epynt, in Brecon, where I have one or two isolated houses. I tried to plant there for shelter without any idea of profit, and I have tried every sort of tree I can think of, but they will not grow. Nothing will grow there.

1386. Of course it would be quite easy for us to ascertain from a map, but you probably would not know what proportion of Wales lies above the thousand foot line?—I am afraid I must refer you to the Ordnance map. About one quarter of Breconshire is open mountain, and we do not leave mountain open where we can cultivate it. As I say, in Breconshire a quarter of the whole county is open mountain, which would hardly grow large trees, and in North Wales the proportion would be still greater.

1387. Have you any experience of the value of other kinds of timber grown in Wales besides larch?—I am afraid not. I cannot give you the value of the timber we do grow, but any woodman would be able to give it to you. We have poplars and oak, and the Spanish chestnut grows very well, although it is not, of course, indigenous. We have also elm, but elm is too brittle for our very windy country.

1388. On this very bare hill would plantations of 2,000 or 3,000 acres, if it were possible to form them, flourish better than the 50 acre plantation which you have experimented on?—What I have said with regard to fencing applies very much to that, as you multiply by four and divide your fencing by two.

1389. With large areas there is more shelter, and that perhaps might enable you to plant rather higher with advantage?—No. I do not think the lower trees would shelter the higher ones.

1390. Is planting well done in Wales, as a rule?—Yes, I think so. We think we plant all right. Our method of planting is this: we have three men and a boy, and the three men are each armed with what is called a Scotch planting tool, a heavy iron thing, to make a hole, and the boy's business is to bring the trees, which are about four years old and about three feet high, and put one in each of these holes. The men work the soil in again with this heavy tool, tread the soil in, and the larches seem to grow extremely well.

1391. Is it easy to get good foresters, head foresters managing men, in your part of the country?—I have two foresters, one a Welshman and the other a Scotchman. The Welshman was bred up to the business by his father, who was also a forester. He was what we should call a better class of labourer. These men can measure the timber and plant, and can estimate the cost of planting, and so on.

1392. Do many landowners and agents have much technical knowledge of planting?—I should say the landowners do not. They have nothing like what you call a technical knowledge. I have not myself, but all these bills are brought to me and I know how many trees they want. We plant 4 feet 6 inches apart.

1393. What about the land agents?—Our general custom is that the forester measures the trees and then he brings the measurement to the land agent. A forester has not the same knowledge of prices of the day that the land agent has. You must understand that the price of timber varies very much. Pitwood, for example, when I was a young man was certainly double what it is now, owing to the importation of foreign woods.

1394. The management of woodlands is a good deal divided between the owners, the agents, and the foresters; there is no one in particular who is directly responsible, is there?—No. Of course the forester is responsible. He knows what trees he requires. I work my own through my own nursery. I do not buy trees, except as seedlings, from the nurserymen. I do not think, if you buy trees at four years old, which is necessary to have good trees, and pay £2 5s. per thousand for them, that it will pay at all. In making this calculation I have charged £1 a thousand.

1395. Do you think that wood managers and estate managers have sufficient knowledge of marketing timber to the best advantage?—Of course we market timber by selling to the dealers. We sometimes sell by auction, sometimes by tender, and sometimes we sell by offering them to dealers with whom we have dealt before. We always have the trees valued before we put them on the market, and if we do not get something like the value we put upon them ourselves we withdraw them, unless we are very much in want of money at the moment, which is not often the case. If you sell them by auction you have the difficulty of having a ring against you; the dealers frequently make a ring. If you sell by tender it is troublesome to the dealers, and sometimes they will not tender, and you can then only deal by offering them to one particular dealer. They pay in bills, and we generally give them a discount for cash, and take the cash at once.

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1396. Do you think that a State model forest, worked in connection with university training or a forest school, would add to the productiveness of the woodlands by increasing the technical knowledge of the different classes interested in it?—I think that with our simple foresters, with the skilled agent, and with a landowner who has a sort of knowledge that every landowner is sure to get as he goes on, we can do it. I not see where you can improve very much upon that.

1397. Upon the present system of training?—I do not think so. If you take a book like Brown's "Forester," you will see he expects foresters to know all sorts of things, even foreign languages. But I do not think it is an advantage in the trade for a man to know a foreign language unless he is going abroad, when, of course, he must know the language of the country he goes to.

1398. I mean instruction in this country, of course. At present, as you are probably aware, the means for any technical training are very limited?—Yes.

1399. Supposing that forestry was properly provided for in a course of instruction at Oxford or Cambridge, do you think that many young landowners going there, or sons of landowners, would take more interest in it?—That I cannot say. I think if young landowners did have a knowledge of the sale of timber, mensuration, planting, and all that, it would be a good thing for them. But they could get that if they chose to go into any first class agent's office.

1400. You are satisfied that the training which they get at present is sufficient for the foresters or the nurserymen or the saw millers who may have to work on the estates?—I think so.

1401. Forty-five years is about your paying rotation in Wales, is it not?—Yes. You must remember that, in addition to the 45 years, you cannot replant again in the same year. You have to wait again at least two years to let the land see the sun before you plant again.

1402. Is game a serious hindrance?—We have no hares. Squirrels are our greatest enemies, because they can get right to the tops of the trees, and just take the bark off, and then the wind knocks the tops off. You will see hundreds of the trees with the tops knocked off. You cannot protect yourself against the rabbit. If you put a wire fence round the plantation it is very costly. In the particular plantation that I speak of, it cost me £9 1s. 6d. for the wire, or about £2 an acre, and that knocks the profit to pieces altogether.

1403. Do you think that any measures might be taken to reduce the nuisance of squirrels and rabbits?—I do not know. When you begin to interfere with Nature you do not quite know where you are going to land yourself. Sometimes I let the farmer have a day at the squirrels, and they kill a lot of them.

1404. Do you find that the tithe or local taxation is much bar to making the woods pay?—I should say not. Taking plantations all round, I think the local taxation is put rather high in our neighbourhood. It is put at 5s., 6s., and 7s. an acre, which, I think, is rather high, but I should not say it was a bar.

1405. (*Dr. Somerville.*) I suppose that in Wales you have a tithe on the land, as in England?—Yes. The landlord pays it now, and includes it in his rent.

1406. Does a tithe in some cases run to as much as 2s. and 3s. an acre on woodlands?—No.

1407. Is it much less than that?—Yes.

1408. I may tell you that in England there are plenty of cases where the tithe runs to 2s. 6d. an acre, or sometimes even more?—We have nothing of that kind, I think. Where you plant the open part of the mountains there would be no tithe. Also in planting the mountains you must remember that when you talk of the large forests, such as the Chairman was speaking about, the tenants have sheep-walk rights through the

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mountains, and you would have considerable difficulty in getting rid of them.

1409. I suppose that the custom which prevails in many places is for a tenant to have some land lower down, with a right of running sheep on to the mountain?—That is our general custom.

1410. A system of commonage?—Yes; he can run as many sheep on the mountains in the summer as he can keep on his farm in the winter; that is the general rule.

1411. I suppose you depend mostly on larch for profits where planting is concerned?—Yes.

1412. Are you troubled with larch disease much in Wales?—I have not had any experience of it myself, but my neighbours have.

1413. Do you think it is on the increase of late years?—We did not know of it until the last few years.

1414. But you have not yourself experienced much of it?—No, I have not had much loss by it.

1415. A tree that is coming very much into favour in this country from the profitable point of view is the Douglas fir. Have you tried that at all in Wales?—I have not tried it for profit, but it grows grandly with us. It is the quickest growing tree we have.

1416. I suppose the reason perhaps why you have not tried it for profit is that you cannot obtain the plants at a reasonable rate?—That was a reason. If we could get them at the same price as larch we should do very well.

1417. You say you would leave the land bare or fallow for some time after you take the crops of larch off?—For a couple of years.

1418. I suppose that is partly in order that the stumps may decay to such an extent as not to encourage beetles?—We think it is desirable to let the land see the sun, which it has not seen for a great many years.

1419. Still, it is not the custom which prevails under systems of scientific sylviculture. On the Continent and in many parts of the world the forests have occupied the same land for hundreds of years, and there has been no clearing, and consequently the ground has been shaded all that time, and, apparently, without any injurious effects?—Would that go to replanting, do you think?

1420. I should think so, and we have it on evidence also that it is not desirable in many cases to allow the land to lie bare at all. Weeds spring up and interfere with the next crop to some extent, and, of course, there is the loss of any return upon the land during the time?—Yes.

1421. However, possibly local circumstances determine cases. As far as I gather from your figures the cost of planting at those high elevations is considerably more than it is lower down—is not it?—I gave you the figures at £40 for four acres, £10 an acre for the lower plantation. Of course, I gave you £400 for 50 years, and that was rather lower; one is £10 an acre and the other is rather lower, as you see. I should tell you also that the higher plantation in this case was partly stone wall. It is so long ago that I cannot give you the reason, but perhaps wire was more expensive than it is now.

1422. I think it will strike many people that £10 an acre for planting even such a comparatively small area as four acres was very high. We have it, I think, on evidence that the cost of planting, apart from the cost of fencing, in many cases does not come to £2 an acre?—I gave you the fencing and planting. I should not give you the same figure for planting alone.

1423. If you plant 4½ feet apart you require about 3,000 trees for the acre, and if you charge them at £1 a 1,000, that comes to £3 an acre for the cost of the material?—I plant 2,551 trees to the acre, 4ft. 6in. apart, which we find to be the most profitable way. I have planted in all sorts of ways, but I find that the most profitable. If you charge them at £1, that is something about £2 10s. an acre. Then, of course, you have to haul those trees, and plant them when you get them up, and so on.

1424. How many trees do you reckon that these three men, assisted by the boy, will put in in a day?—We consider that planting an acre takes two days with three men and a boy.

1425. That is to say 1,200 trees for a day's work?—Yes.

1425. Or about 400 trees per man?—Yes.

1427. It has been stated, not before this Committee, but in the transactions of one of the Arboricultural Societies, that injurious forest insects are imported into South Wales in large numbers through the agency of the timber which is brought from France. Have you ever heard of a complaint of that sort?—I have had no experience of that.

1428. (*Mr. Marshall.*) You were kind enough to tell us that you gave the land two years rest. Do you then generally plant it again?—Yes.

1429. With larch?—Yes, with larch.

1430. Do you plant larch clear without the mixture of any other trees?—We think it better. I have planted with other trees, but I do not think it answers.

1431. You do not plant any shelter belts round them at all?—We do sometimes plant spruce firs round the edge, but I do not think there is much in it.

1432. Have not you had an instance on your estate—I think I remember hearing about it—of one plantation being cut twice during your ownership?—Yes; I have one instance of it.

1433. And that did remarkably well?—Yes. It was twice in my lifetime, not in my ownership. It occurred when I was a boy. It was a profitable plantation on about the same level as the one I have given of 600 feet above the sea.

1434. Evidently in a place that suited the growth very well?—Yes.

1435. With regard to larch disease, you say you have not had it, but your neighbours have; can you give us a reason why you have been immune from it? Is there any difference in the land?—The larch plantations I have are mostly on the old red sandstone. I naturally speak with hesitation, but I think the disease has been chiefly on the Silurian, or on the Cambrian formation, which is a kind of shale, very poor stuff. Also the soil in the north of the country is very shallow; what we should call unscientifically, rock. You get to the hard rock directly.

1436. With regard to labour, have you any difficulty with labour down there—you are in a coal mining district?—Labour is dear. An ordinary labourer would get 18s. a week.

1437. That is the man who works in your wood?—Yes.

1438. Would he get a little more than the ordinary agricultural labourer?—No.

1439. About the same?—About the same.

1440. If woodlands were more gone in for, it would not very much better the position of the man who works in the wood in your district? It would not give him more work, or give him a rather higher wage?—No. When I went down there they were getting 12s. a week, but now they get 18s., which makes a difference.

1441. What is your opinion of the rent of the land? What would you suppose that this land of 670 feet altitude—64 acres—would be in rental value?—It would be about 15s. to 18s. an acre; I do not plant this land.

1442. And the land at the higher altitude—the 60 acres?—No rental at all.

1443. Just a nominal rental for the sporting rights?—No, it was part of the mountain, a sheep walk. It was planted by my grandfather on the mountain as a general exhibition of ownership, I think, more than anything else. When I came to work it out for the purpose of giving you information to-day the loss was so large that I should not think of planting it any more.

1444. Are those particular plantations beyond the Hermitage, high up?—One was beyond the Hermitage, and the other over the hill in the Cwmdu Valley. I have cut them down, and I have not replanted them.

1445. (*Colonel Bailey.*) You said, I think, that there were immense quantities of pitwood imported from abroad?—I think that is so.

1446. Into your part of Wales?—Yes.

1447. I suppose there is much more imported wood used than is locally grown?—I think so.

1448. Do you think there is a vast market?—I have no real knowledge of that. I live in a mining country,

but I have had nothing to do with mines for a great number of years now.

1449. But you believe as a resident in that part of the country that there is a great market for pitwood timber?—I do; the price has gone down very much.

1450. I suppose that is so all over the country?—We sell it by the cord.

1451. Do you grow wood specially for pitwood?—No. It is the thinnings of the larch plantations.

1452. At what age are they generally sold?—Twenty years. On the particular plantation I was alluding to the sale of pitwood at the age of twenty years would come to £57 10s.

1453. Do you know whether the miners themselves who buy this wood prefer it to foreign timber, or how does it compare with foreign timber in their minds?—I cannot tell you that. When I had anything to do with the coal industry we used my pitwood for propping up the roofs of the mines.

1454. You mentioned that you did not think it would pay to plant largely over the Welsh mountains, because you think they would only bear one crop, and that a second crop could not be raised which would give as much profit as the first?—In planting on the Welsh mountains you would plant on land which I assume would cost you nothing, or next to nothing.

1455. And you think the second crop would be worse than the first?—Yes.

1456. Is that the result of your experience, or why do you think so?—It is what my agent gives me as being the result of his experience, but, as I said, I have no experience of it myself.

1457. You are speaking of larch woods?—Larch entirely.

1458. Grown pure—without a mixture of other species?—Yes.

1459. I ask this question because it is new to me to hear that. Of course it is known in woods of pure larch, if they are left to grow beyond a certain age, owing to the thin character that the wood assumes, there is a certain deterioration of the soil; but in parts of the Continent of Europe where larch is grown as an important crop, that difficulty is met by mixing larch with beech or silver fir, or some tree of that nature. Has that been tried in Wales?—Yes. I have woods planted with forest trees amongst the larch.

1460. Do you find that successful?—No, I do not think it is, and we have left off doing it. We do not think it is successful.

1461. Have you grown woods in that way up to a considerable age, or are they quite young still?—The intention in all those woods was to plant ornamental woods, and to take what larch we could, to use the larch as nurses, but I do not think the wood taken as a wood would be so profitable as planting larches.

1462. As regards the individual larches, do they grow better or worse when mixed in that way?—I think it is the larch that hurts the other trees.

1463. The larch gets on pretty well under those conditions?—The larch gets on pretty well generally.

1464. You said that on certain high exposed ground, where you had a certain number of isolated houses, you had failed to raise trees?—Yes.

1465. What species of trees were they?—We tried larch, Scotch fir, and sycamore.

1466. Was there any special difficulty that they had to contend against besides mere altitude?—Peaty soil.

1467. And strong winds?—Yes.

1468. Were any special precautions taken to protect those young trees? I suppose they died when they were young?—They grew up little stunted trees like those you see on mountain tops. We could not grow them to any size.

1469. They were just planted in the ordinary way?—Yes.

1470. Without any special precautions?—Yes.

1471. I have seen at the top of a very high mountain in France, exposed in the way you speak of, beech trees grown successfully by building little rough mounds on the windward side to shelter them. I suppose you did not try any plan of that sort?—No.

1472. They were just left to themselves?—My own opinion is that that would not have made much difference, because they were turned off about six feet from the ground.

1473. Do you think other trees grown under the shelter of these would have succeeded?—No.

1474. Very often in exposed places on the Downs, and elsewhere, you see a piece of the outside of wood that looks as if it were shaved off, and then gradually further and further away from the wind the trees grow up all right?—I see that by the seaside in England, but it will not apply to the top of the Welsh mountains.

1475. You said, I think, that you did not believe any special technical training was necessary for forestry, that all that was necessary could be learned in the agent's office. Would you hold the same principle as regards agriculture?—I rather think I would. I think that the tenant farmer's son has a better chance than a gentleman trained at a college such as Cirencester and those places.

1476. And you think agricultural colleges are not necessary?—I would not say that. If I had a son going in for agriculture pure and simple I should certainly send him to one of these colleges. They learn all sorts of things there, veterinary knowledge, etc., which may be useful.

1477. If a man's profession was to be that of managing forests of great value, and the value of large forests is enormous in good situations, would he not be likely to require a similar sort of training to manage them efficiently?—My own feeling is that the man trained from youth under a forester would have the knowledge he requires without the expensive apparatus that you seem to have in your mind.

1478. But that would not apply to a man following the profession of a farmer, for instance. He could not learn his profession adequately from a farmer?—If a gentleman is going to start a farm I think all the knowledge he acquires of soils and things of that kind is very interesting to him, and may do him good in farming.

1479. I will trouble you with one more question, which is perhaps hardly relevant to the enquiry we are making, but which will interest me. You mention putting in plants with a heavy tool that drove the hole into the ground. What age were the plants?—About four years.

1480. Were they raised in your own nursery?—Yes.

1481. In what condition were the roots, straight or curled?—The roots were very good. I had intended to bring one up to-day to show you.

1482. Were they straight roots or curled round?—They were roots that looked as if they had gone into the soil in every direction.

1483. They were in a natural position?—I believe so. Those trees came from my own nursery; they are bought as seedlings, and they are left until they are yearlings, and they are transplanted in the nursery to give them a little more room.

1484. In some of the English and Scotch nurseries they do that. It is the custom to plant them out in shallow trenches, and the roots get a bend to one side. Yours have not that defect?—No; all my trees are as well as they can be.

1485. (*Professor Schlich.*) I think you said, in reply to Mr. Marshall, that land which gave this high return used as larch plantation on the lower elevation was worth for agricultural purposes from 15s. to 18s., or about the same that it gave by being put under larch?—I think it would be.

1486. I did not quite catch what you said about the value of the inferior plantation upon the hill?—That was open mountain.

1487. What would that be worth an acre if not used for forestry?—It is used only for sheep walks and sporting purposes.

1488. What would it bring as such?—It is never let. It increases the value of the farm adjoining. Some of these farms have perhaps 400 or 500 acres of sheep walk, even though it is a small farm. You get your profit in the farm below.

1489. It is thrown in with the farm?—It is thrown in with the farm. It is common land. The soil belongs to the lord of the manor, subject to the grazing rights of the tenants.

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1490. May I ask what is about the total area of your woodlands?—I do not know exactly: perhaps about 600 or 700 acres, or more I dare say.

1491. Do you grow principally larch there?—Where we have planted for profit it is entirely larch. We have old woods besides.

1492. Ornamental woods?—Ornamental woods.

1493. What you have grown for profit, however, is all larch?—Yes.

1494. And you have no experience with regard to the economic growing of trees of any other species for profit?—No.

1495. Your only experience in this respect is restricted to larch woods which you cut over at the age of 45 years?—Yes, with two thinnings before.

1496. Am I correct in stating that your opinion that an improved education is not wanted is based simply on the growing of larch woods which you cut over at the age of 45 years?—When you say my opinion is that education is not wanted, you must limit that, if you please, to the growing of larch trees. I think the present education of the forester is sufficient for that.

1497. That is what I mean. Your opinion with regard to further improvement in education of the forester not being called for is based on the experience which you have gathered in growing larch woods, which you cut over the age of 45 years?—Yes.

1498. You have no other experience with regard to that?—No. When I spoke about the thinnings being £46 in ten years and £57 10s. at twenty years I was referring to the four-acre plantations, not to a single acre. All the thinnings I have been giving as a good plantation run over four acres.

1499. What aspect had the good plantation of four acres on the lower elevation?—The aspect is slightly north-east.

1500. What was the aspect of the upper plantation which was not a success?—There are two or three plantations, all high; they were on the two sides of a mountain. The aspect of one was south-east, and the aspect of the other would be almost north-west.

1501. The accounts for the two have been kept separate, have they not?—I am afraid we have not kept them. You must understand that on an estate they are planting one time of the year, and doing all sorts of things, such as hauling, at other times.

1502. I only want the mere fact recorded that they were not thrown together?—No.

1503. But they were very much exposed to wind, especially those on the north-west?—Yes.

1504. How far are these woods from the sea?—Between 30 and 40 miles.

1505. But they are very much exposed?—They are very much exposed. Another element in their being so very unprofitable is that they are high up in the mountain, and are very hard to get down, and they are also about ten miles from the nearest canal.

1506. And there are no roads to transport the timber?—Not from the mountain. You have to get them to the valley first.

1507. And probably the cost of transport is very high?—Yes.

1508. If that material, instead of being situated on the hill, without roads, had been situated in a place like your four-acre plantation, it would probably have fetched a much higher price, would it not?—Yes. If I had planted 50 acres of good agricultural land, of course I should have got a higher price. I should have got a still higher price than the price I gave you with regard to the low-lying plantation, because the fencing would be so much smaller. I might have bought a piece of land where the fences were already around it, which would have made a great difference. But I do not think it would answer. We generally feel it does not pay to plant land that is worth more than 5s. or 6s. an acre. An experienced agent cautioned me not to plant any land over 8s. an acre.

1509. (*Mr. J. H. Lewis.*) You have drawn attention to the great difference between the prices that prevailed 30, 40, and 50 years ago and those which prevail now?—Yes.

1510. Do you not think it possible that, owing to the timber supplies of America and Scandinavia becoming exhausted, the prices in this country may considerably increase, I do not mean, of course, in the next few years, but at some long interval?—That is so speculative a question that I am not able to answer it.

1511. I suppose there is some possibility of a rise of that kind taking place?—But it seems to me so remote that I do not take it into consideration in planting. The difference in price, I might say, is quite half what it used to be. We used to get about 28s. a cord in the woods, and now we get 14s. or 15s., or something of that kind.

1512. That is, of course, owing to the rise in steam merchant shipping and the greater facilities for transport that exist at the present time?—Yes.

1513. When you spoke of a plantation of four acres, did I understand you to say that it cost £30 to fence it?—Yes.

1514. Do not you think that is rather a high charge for fencing a four-acre plantation?—Well, take the labour. I have 40 perches of fencing.

1515. What kind of fencing?—Wire and oak posts, 7 yards with us is a perch, and I charge it at 3s. a perch if you are planting with oak, and 2s. 6d. if you are planting with larch. That comes to £12. Then you have six wires of No. 5 at £11 a ton.; 240 yards require 14 cwt. at 11s. a cwt., and that is £7 14s. You have a man and a horse hauling the wire to the wood. 7s. You have 1,680 galvanised iron staples, 16s.; you have two horses two days carting stakes, £1 8s.; you have 548 cleft oak poles at 6d., which is £13 14s.; you have 12 straining posts at 5s., £3. The whole of that comes to £38 19s., and if you have to clear the ground you must add £2 for 4 acres, or 10s. an acre.

1516. A large area, of course, would cost proportionately less?—Yes. If you double the size you halve the cost precisely. I might just show you a little diagram which will explain that directly. All the inside of the fences go out when you enclose a larger area.

1517. I think we can quite understand that it would reduce the cost very considerably. You might possibly show a very much better result upon a larger plantation than you would on a plantation of four acres if you were to take into account the reduction in the cost of fencing the larger plantation?—That is so.

1518. You consider the result you have attained of being able to sell £46 worth of thinnings after ten years and £57 10s. after twenty years, and the whole crop for £400, after 45 years, as a satisfactory result, I presume?—Yes. That gives you 3 per cent. for your money and an annual rental of about 18s. an acre for your land.

1519. Can you tell us whether you consider there are areas of similar land which could be suitably afforested in that part of the country with which you are acquainted?—Do you mean large areas?

1520. Yes, here and there, considerable areas. I do not say large areas in the same place?—If you had the fee simple of the mountain, yes; but you must not interfere with the tenant rights of the mountain.

1521. Do you mean the rights of grazing?—Yes; you must not suppose that you can take the mountain or even buy it for this purpose. If you buy the manorial right of the mountain it does not give you the right to plant to the injury of the tenants.

1522. Is it possible in certain places to expropriate and compensate the tenants for their grazing rights?—No. It is so valuable to the farms below that unless you could buy those farms altogether, buy the whole manor as it were, I do not think you could get that right, and even then it would be extremely unpopular. I do not, of course, know whether this is evidence which ought to be recorded.

1523. (*Chairman.*) It is a very valuable point of evidence if we might have it. I think it is very important as showing that the expropriation would be unpopular?—I do not think it could be done. I think it would be a very undesirable thing to do. It is a different thing planting a small piece of land on the mountain to show your ownership and taking a large piece if you wanted to do it for profit, as you would have to do. I am sure it would not answer.

1524. (*Mr. Lewis.*) But would it not be possible by arrangement with the tenants to plant certain selected areas? It would have the effect of giving their animals more shelter, and at the same time you might make them some compensation?—Yes, but a belt for shelter and a large plantation for profit are two different things.

The manor lord plants trees for shelter, but if you want to plant for profit you must take a large area.

1525. Do you know that landowners have at their disposal at present land which they could plant if they were so disposed, but which, owing to the fact that perhaps they are short of capital, or that they do not know who their heirs might be, or that they want to see some profit from it in the course of their lives, or that they are trustees, and are unable to plant—do you know whether there are such landowners in your experience?—No, I do not know such landowners. We do plant rough mountain fields sometimes, but it must be done with a good deal of judgment. I do not think you could plant Welsh mountains either for profit or from a political point of view.

1526. What part of the country do you specially speak for?—The county of Brecon.

1527. Your personal experience is entirely limited to the county of Brecon?—Yes.

1528. You do not know anything about the Birmingham gathering ground, do you?—Yes. I sold some mountain land to Birmingham which was part of my own estate.

1529. Do you think that could be profitably afforested?—The Birmingham people acquired from me a very large tract of mountain land, I think 14 miles or something of that sort, of which I only had what you call the manorial rights. I believe they bought the rights of the tenants altogether, because the bottom of the valley will be turned into great lakes, and they may have to obliterate the tenant right altogether. That, perhaps, would be suitable land to experiment upon.

1530. They would be perfectly free to experiment if they thought fit?—If they are perfectly free, which is not a fact that is within my knowledge, that might be a suitable place to experiment.

1531. (*Professor Campbell.*) May I ask what is the nature of the land immediately adjoining the four-acre plantation?—It is agricultural land.

1532. There are cultivated fields close up to that plantation?—Yes.

1533. Would not you debit the agricultural land with part of the cost of the fence which is round the plantation? Does not it act as a fence to the cultivated land round about?—I do not know how that may be, and I cannot answer that question. It might be possible that you might plant a field already fenced or something of that kind. It is quite clear that if you have exceptional advantages for planting, such as having no fencing to make and being near a railway station, and so on, then you make a much larger profit.

1534. It seemed to me an extraordinarily high charge for fencing a plantation?—It is about the same price that I observe in Brown's "Forester." He put it at 1s. 3½d. a yard for fencing. You will find that, although mine looks a large sum, it is 560 yards of fencing, and you will be surprised to see how slack people are in calculating a thing out. They do not charge for haulage and for many things. I do not suppose Brown charges at all for the haulage of his fencing, and his book was written many years ago. I think my price is a low one. At all events, if you go into the market and try to buy it at the price I have put it at, I am quite sure you will get it no cheaper.

1535. I think you said that the price of pit props had fallen very much?—Yes.

1536. Does the same statement apply to other classes of timber that you have sold?—I cannot answer you that. I think larch poles keep their price.

1537. Do you think that they fetch as good a price to-day as they did 40 years ago?—I cannot answer that.

1538. But generally you think the prospect of timber growing in your country is very poor?—No. I think you would get 3 per cent. for your money, and I think you would get 18s. an acre for your land, assuming you do not plant in less plantations than four acres, and assuming that they are fairly square, because if you have an irregular outline your fence is much longer, and assuming you have not to protect yourself against rabbits.

1539. But I presume you have to do that?—Then you must add £2 an acre to your expenses, and if you have to do that it takes about half the rental away.

1540. Still, there are good prospects even with that?—Yes; another thing in timber is that you must not of course take this £500 as the gross receipts on four acres. To have that yearly you must, of course, have forty times your four acres, or 160 acres, devoted to larch plantation to get your profit.

1541. Are you extending the area under timber?—Slightly; I replant always. When I have a piece that I can plant with advantage I do plant it.

1542. Are the other landlords in the county doing the same, do you know?—I think so. The lower parts of the mountain, I think, are profitable to plant if you have the farms below in your own hands.

1543. Generally speaking, do you think there is any greater interest taken in forestry now than there was twenty years ago?—No. We live in a coal country, and the planting of pitwood has been always one of our trades.

1544. You think there is no special interest being taken in the subject—is not the subject more talked of now than formerly?—No. We have been always alive to the advantage of it.

1545. With regard to the hill that you planted that turned out unprofitable, what is the nature of the plants that are growing on that hill—heather or bracken?—Heather and bracken. Where these woods were planted I think is below the heather. The heather does not grow with us as low as it does in Scotland.

1546. And there was bracken, too?—Yes.

1547. Had you to make a clearing before you planted?—These trees would be 50 years old when I cut them down five or six years ago, and it is beyond my experience.

1548. I beg your pardon; it was planted by your predecessors?—Yes.

1549. I suppose you are aware that there is considerable difference between the Continental system of forestry and that practised in Great Britain?—No. I know nothing of the Continental system. I shall be very glad to learn something about it whenever your report comes out.

1550. But you have heard that forestry is practised very successfully on the Continent under a different system from that carried on in Great Britain?—It might be so.

1551. Has not your agent spoken to you on that subject at all?—I have no knowledge of it.

1552. He appears to be guided by Brown's book?—I looked into Brown to verify my own figures with regard to the fencing. You must remember that Brown's book was written a great many years ago when labour was very much lower than it is now, and therefore his figures must be taken with caution. Even assuming him to be absolutely right in what he said, his figures are out of date.

1553. Have you ever found it necessary to call in the advice of an expert who knew more of the subject than your forester or your agent?—I do not know where to find him.

1554. And neither your forester nor your agent has called in experts?—No.

1555. Have you not found any reason for doing it?—No. We have never done so at any rate. I do not know where to look for a man. We have been at it all our lives, and my forester and agent seem to know all about it.

1556. Conditions change and methods require to be changed too sometimes?—That is true.

1557. But there has been no change?—I do not wish to be taken as speaking against any amount of education that may be in your mind. All I say is that just for the planting and growing of larch trees experience is the best teacher.

1558. (*Mr. Stafford Howard.*) Do I understand you to say with regard to the plantations on the hills which were not successful, that they were merely planted more as an assertion of right of the lord of the manor?—I think that is so. They were very ugly things put out on the mountain, and I believe they caused a great deal of friction. The people thought it was an encroachment on their rights.

1559. It is a thing that could not be done very largely without creating a disturbance?—No, unless you also had the farms below, and by purchase practically obliterated the rights. If you do that it is lessening

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the population and making great changes in the country. I would not counsel it for a moment.

1560. You do not give us, I think, the proportion of the cost of the fencing to the cost of the plantation on the hills. Perhaps you have not got the separate items. I suppose it was a very large proportion?—We could only estimate it, because it was done 50 years ago, and we knew nothing about them. There were 108 perches of walling at 8s. a perch, £43; then we had to raise the stone, haul it to the hill, at 2s. a perch, £10 16s.; labour in erecting 108 perches of wire fencing—partly wire and partly wall—£13 10s.; 15cwt. of No. 5 wire at 11s. cwt., which is the price to-day, £8 5s.; hauling the wire to the wood with two horses and a man one day, 14s.; 2,260 staples at 1s. a hundred, and so on. It has all been carefully worked out, and it came in the one plantation to £93.

1561. It would be impossible, would it not, to have a plantation of land which is grazed by sheep without fencing?—Quite impossible.

1562. And having regard to the capabilities of Welsh sheep, the fencing has to be pretty high and pretty well done?—And then you will not keep the Welsh sheep out.

1563. Is it not a fact that many of those commons are overstocked with sheep?—I think not.

1564. Do you think that the people really keep within the amount that they ought to have, considering the size of their holdings below?—No. I think it is very loosely done, but still I do not think the mountains are overstocked. The custom of the farmer is to stick to the piece of the common above his own farm, which they call "arhosfa," which, I believe, means a resting-place. They drive the sheep up the mountain against their neighbour on the other side, quite up to the boundary. If the sheep go beyond the boundary I suppose they do not mind. If you appear with a dog, every sheep knows its own boundary, and they run back directly. They are what are called settled sheep, and know the hills as well as possible.

1565. Supposing, as Mr. Lewis suggested, it was possible to plant selected areas on these grazing grounds, you could not do that without interfering with the rights of particular farms—you would not be taking a certain proportion from all the tenants, but you would be practically monopolising land which belonged to one or more individual tenants. You see my point, that the mountain, although it is held in common, is really divided up?—It is held in common, and it is practically divided up. There is no fence, and I am not sure that any farmer could claim right to the resting-place.

1566. As a matter of practice if you planted 50 or 100 acres on any of this common land, you would be really interfering with one or more particular men, and not taking a certain proportion from all of them?—Practically, yes, but legally I do not know.

1567. Practically, I mean?—Yes, practically.

1568. Practically you would be interfering with the grazing rights of one or two particular farms?—Yes, that might be so.

1569. Do you know of any areas of this kind that are not subject to grazing rights in the County of Brecon?—I am not sure about the Birmingham area. They purchased the manorial rights, and I think they acquired the tenant rights as well.

1570. Apart from that, are there any of these mountain lands not subject to grazing rights as far as you know?—Not so far as I know.

1571. That must be a standing difficulty in the way of getting any large area for planting?—I think so.

1572. Do the sheep get into any of your plantations?—Yes. The sheep get everywhere; they jump like horses, and they run up a straight wall if it is not too high for them and get over the top.

1573. Therefore plantations a little slow in getting away on exposed grounds would have a worse time of it with the sheep than plantations that got away rapidly on a low ground? They would be exposed to their attacks for longer?—I have not heard whether the sheep would very likely get into the plantation in large numbers.

1574. I suppose you consider that the large profits on the favourable situations to which you refer are within the reach of any owner who manages his woods properly?—Yes. Of course you can only do it to a limited extent, because you must remember you are locking up your capital for 45 years, and losing the rental of your land for 45 years. When you think of 45 years in comparison with a lifetime it is a very serious thing. It can be only done with judgment.

1575. Apart from the locking up of capital, the actual returns are very profitable on suitable situations?—I have allowed 3 per cent. for the money and 18s. an acre for the land. I cannot put it higher than that, and I cannot put it anything like so high if you have to protect yourself from rabbits.

1576. (*Sir John Rolleston.*) I think you said you had given some attention to the rental at which you could afford to plant land?—Yes.

1577. I think you said 8s. an acre?—It was given to me by a very experienced agent as the outside at which I ought to plant it.

1578. If you can get 8s. an acre rental you had better not plant?—You had better not plant. That was his opinion, but I put it still lower. I should not like to plant land that I could get about 5s. an acre for. You cannot use it for any other purpose afterwards. You take it as clean land, and when you leave it it is full of larch stumps. I have had all sorts of accidents which ought to be taken into consideration. I have had trees twelve or fourteen feet high with the tops nipped off by rabbits owing to the snow from the mountains drifting up the side and enabling them to get to the top of the trees. No fencing will provide against that.

1579. You would say from your experience 5s. an acre?—Yes.

1580. If you can get 5s. an acre you had better not plant?—I think you had better not plant if you can get 5s. an acre. Of course it might be a question whether you would plant or not if you could get 5s. an acre, but above that I do not think you ought to plant. In considering it for assessment purposes we put the plantations all round the country at 5s., 6s., and 7s. an acre. I was Chairman of the Commitee, and I think the public thought I put it too low, but I am quite sure I did not.

Mr. D. Robertson.

Mr. Donald Robertson, called; and Examined.

1581. (*Chairman.*) You are the representative of the Royal Scottish Arboricultural Society?—Yes.

1582. You are a forester at Dunrobin, Golspie, and have had a long experience of forestry?—Yes.

1583. Were you trained originally as a forester?—I have worked in the woods nearly all my life; I do not know that the training was very much.

1584. Have you been abroad?—I have been to Germany.

1585. Do you think that if you had had some of the kind of training which you saw some signs of there you would have been the better for it as a forester?—Yes, very much so.

1586. In your statement I think you attach great importance to the provision of a proper experimental State forest in this country?—I think it is really very much needed as an object lesson to show foresters and proprietors how timber should be grown at all stages of its life.

1587. Do you find that an object lesson is really more important than theoretical training?—Both combined would be better. Theoretical training without practical training or an object lesson is not of much service.

1588. You want the two together?—Yes.

1589. You think all classes need training—owners, factors, and foresters?—Yes, I think so.

1590. All equally?—No, there are exceptions.

1591. I mean that they should all be equally trained?—I think the owner ought to know something about the timber, and then he would be more apt to take good advice from the forester.

1592. He would show more interest in it?—Yes.

1593. I think you are in favour of State forests?—Yes.

1594. You believe there is a large area of land which could be profitably occupied by timber which is now comparatively waste?—In Scotland there is.

1595. You do not know so much about England?—I do not know so much of England.

1596. Have you been through any of the woods belonging to the State in England?—I have been through two of them.

1597. I suppose that as you saw them there is not much to learn there?—I did not see anything much to learn.

1598. You think that a demonstration area or State forest should be begun on the site which was likely to show the best results?—Yes, I think the site should be very carefully selected.

1599. Have you any idea of a good site?—No. I knew a good site some years ago, but it is now occupied.

1600. Where was that?—Skibo.

1601. You think that a site should be chosen where there is broken ground, so that the different methods of transporting woods economically from steep land could be shown?—Yes, that would be advisable.

1602. Have you had any experience of taking timber off hill sides?—Yes.

1603. Are there not methods employed abroad, such as slides and other means, which might diminish the cost of transport?—Yes, there are various other methods, if you had a sufficient area to warrant you in laying down the plant.

1604. You want a large area for a demonstration forest, possessing the different varieties of soil, of hill and of level, so as to demonstrate the different ways of growing the wood and taking it off the ground in the cheapest way?—Yes, if it was possible, but if we had an area to show us how to grow it well it would be better than nothing.

1605. Do you think the manufacturing of wood is as well understood as the growing?—By the timber merchants it is; but I do not say that about the estate management as a rule.

1606. Do you think the forester should have a training in the utilisation of forest products?—I think he ought to know how to utilise them to the best advantage.

1607. Do they generally know how to do that?—I am afraid not.

1608. Are the timber merchants capable men?—Yes, they are so far as I have seen them; they generally try to work the thing to the best advantage, in the cheapest way possible.

1609. Do you think it is to the advantage of woods that the forester should take out the timber from the felling areas, or that it should be done by the wood merchant?—Unless the forester has the necessary experience to take out and manufacture the timber, I think it would be better to sell it on the ground.

1610. For the economical working of the woods, do you think it would be better that the forester should be capable of taking out the wood?—Yes; but if he has not the experience I think it would be better to sell the trees where they stand.

1611. But it would be desirable that he should have such experience?—Certainly.

1612. I believe you think that in well-managed plantations you would find a considerable expenditure on labour?—Yes.

1613. You think as much as 20s. an acre a year would be available for labour in well-managed woods?—if you manufacture the timber it will require all that.

1614. Coupled with the thinning and the planting?—Yes, and the manufacturing and the transport to the consumer.

1615. Do you think that the area of timber in Scotland is decreasing?—Yes, I think so.

1616. And that the quality of the wood is deteriorating?—Yes; I think there are large areas which are classed as woods that are really only skeleton woods.

1617. I believe you have had experience in raising trees?—Yes.

1618. Can they be raised cheaply in home nurseries?—Yes.

1619. Can the new conifers be raised cheaply?—Yes.

1620. Do you think the new conifers, like the Japanese larch, or the *Thuja gigantea*, or the Albert could be raised in nurseries as cheaply as larches?—Yes, if you purchase the seed reasonably it grows as easily as larch.

1621. And it is possible to get the seeds at comparatively easy rates for most of these woods, is it not?—Yes, in most years it is.

1622. And you think the growing of these woods in the Highlands is likely to be a profitable industry?—Yes, in a good many of them, in the whole of them I think.

1623. Do you think any of them make good mixtures with larch?—*Douglasii* and larch I have found work fairly well together.

1624. Many of these new coniferous trees grow unusually well, do they not, in the Highlands?—Yes, but you have to select the situation for them.

1625. Do you find fencing a heavy item?—Yes, the fencing is always a very heavy item.

1626. Is it fairly charged to the plantations, usually?—No, I do not think it is. The plantations ought not to bear the cost of fencing, because the trees do not require a fence to keep them on the ground.

1627. We have heard some evidence as to the cost of fencing; what do you find it costs to fence?—It depends very much on the area and the class of fence.

1628. How much does it cost a yard on average ground?—For an ordinary 6 wire fence you have to pay about 5d. a yard.

1629. Creosoted posts?—Yes, creosoted posts and galvanised wires.

1630. With posts at how many feet apart, 18?—I always put them closer than 18. Of course if you run them at 18 you can do it cheaper than that.

1631. In a great many localities posts are put in at 18?—Yes, where you are not exposed to heavy stock.

1632. Wire netting fence against rabbits with three wires is not very much more expensive, is it, than an ordinary 6 wire fence?—I think it adds about 3d. a yard to the cost, that is if you put fairly strong netting on, and it is no use using weak netting. If you have got to make it proof against cattle it adds still more to the cost.

1633. Do you think that the present rents which are obtained from grouse and deer in the Highlands are more profitable than could be obtained for planting on much of the area that is so-called waste?—I think a great deal of the sporting rents might be pretty much as they are, and a considerable area planted.

1634. In your statement you talk of the happy-go-lucky way in which timber is now often sold. Does that mean it is sold when the owner is hard up?—That is so.

1635. Is not that much the same thing as it would be for a farmer to sell his oats green or rotten?—It is pretty much the same as a farmer who has to sell when he requires money; he has to sell for what he can get; but I had another idea in my head when I talked of the happy-go-lucky way of selling. Sometimes young timber is sold before it has probably passed the pole stage.

1636. Is there any reason why pulping should not be introduced into this country?—I am afraid you must find the material first.

1637. But supposing you planted your spruce, you would not object in that case to its being cut early for a specific object?—No, but in these sales that I refer to the subject, to begin with, was thinned until it was much too thin, and then clean cut. I had in my mind's eye about a thousand acres which have been cleared in Inverness-shire recently, which fetched about £11 per acre only.

1638. With regard to the cost of transport, are the woods in the North well laid out as a rule for getting wood out cheaply?—Yes, the bulk of them.

1639. Have you any experience of traction traffic?—Not much.

1640. Is the saw-milling machinery up-to-date?—It might be improved upon if one had enough area to work upon.

1641. Do you think there is much damage done by bad pruning and other forms of mis-management?—Yes, I think there is far too much necessity for pruning really; I think we ought to make Nature prune more than we do.

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1641.* You believe in the continental method of growing timber?—Yes, I certainly do.

1642. And you would like to see those methods demonstrated?—Yes.

1643. Therefore you hold that the surest way to obtain progress in forestry is to have a good State forest managed on foreign models, demonstrating what can be done in this country with all the different kinds of timber?—Yes. There is an idea amongst the greater number of people, especially with regard to young wood, that when it becomes a regular thicket it should be thinned, when it really should not be thinned. I think a good deal of money has been spent in that way unnecessarily.

1644. You feel that in spite of all your experience in forestry you would have left better work behind you if you had had a thoroughly scientific training?—Yes, or even if I had got an object-lesson to look at before I began.

1645. Do you find many men in your position who are keen to have the advantage of seeing object-lessons such as you wish?—I find a great change in the opinion of the general foresters since that excursion to Germany.

1646. Do you think that the forester on the average estate is left a very free hand to do the best he can with his woods?—No.

1647. You do not think he has sufficient authority to be able to manage his woods properly?—No, not as a general rule.

1648. Is there much injury by game?—Yes, game and squirrels.

1649. Is there any way in which these nuisances could be dealt with by collective action. Do you think it would be possible to have any arrangements by which squirrels could be destroyed, or whether one owner who does not keep ground game should have the right to call upon his neighbour who does to wire net his rabbits off?—I think that is really necessary. In the North of Scotland, particularly, there is an enormous damage done by squirrels.

1650. What is the reason why they are not put down?—I think lack of interest on the part of the proprietor.

1651. Are railway rates high?—Yes, railway rates are high in comparison to the sea rates.

1652. Do you think that traction traffic affords any effective means of competition with the railway companies?—Not for very long distances; for a distance of 10 or 12 or 15 miles it probably would.

1653. That often enables you to get to the sea-board?—Yes.

1654. (*Mr. Stafford Howard.*) What area of woodland are you responsible for now?—About 15,000 acres.

1655. What kind of woodland is it mostly?—There is a large crop of natural birch, and the greater portion of the planted wood is Scots fir, hard wood, larch.

1656. Has planting been regularly done on the estate for years past in proportion to what has been cut: has the area been kept well planted up?—Not for the last 20 years.

1657. It used to be?—Yes.

1658. Do you find that is the case, so far as you know, with other estates in that district?—In a good many estates that is really the case. There are exceptions of course; there are other estates where extensive plantations have been made.

1659. But on the whole do you think the area of woodland is decreasing or increasing in your neighbourhood?—I think it is decreasing.

1660. Largely?—I should say that the cubic contents of timber have decreased very largely. The area nominally under wood may not have decreased so much, but I think that the cubic contents of timber on that area have very much decreased.

1661. Do you think there is room for improvement and need for improvement in the methods?—I think there is very great need for improvements in the methods.

1662. And you are quite convinced that taking the foresters over to Germany to see the methods there has been productive of great good?—Yes.

1663. And there is much greater desire now to consider new methods and possible improvements than there used to be?—There is a desire to grow a better class of timber really.

1664. Better class in the sense of timber that is more marketable and will fetch a higher price?—Yes.

1665. Do you think the timber in this country as so grown would compete very well with the foreign timber?—There is no doubt but that we can grow equally as good timber as they do in Germany, because the old natural woods prove that to us. It was really of a better quality than the Scots fir timber we saw in Germany. The old natural Spey woods, for instance, produced better timber in my opinion than that which we saw grown in Germany. There is no mistake our land would produce good timber if it was grown on sensible lines.

1666. If an area were acquired for what is called a State forest largely for the purpose of demonstration, I suppose that it ought to be in Scotland?—I think there ought to be one in Scotland.

1667. (*Professor Campbell.*) In reply to a question by the Chairman you mentioned something about a sum of 20*s.* per acre. I did not quite catch what it was, but I think it was in connection with labour?—The labour market, really the workers, derive 20*s.* per acre from a good crop of timber that has been 60 years in growing.

1668. It provides 20*s.* per acre for the labourers?—Yes, per annum, spreading all over the time that it has been under timber.

1669. The growing of timber does not then necessitate doing away with all the labourers on the land, does it?—Ultimately it would provide a great deal of labour where there is no labour at all.

1670. Are there many industries usually associated with forests that would keep labourers on the land? I think I heard someone say that such things as clog-making, and a variety of small industries spring up where you have forests?—We have clog makers and bobbin mills where they turn reels for thread works and different sizes of bobbins.

1671. Does that give employment over a large part of the year?—The cloggers and the turning mills work all the year round.

1672. So that owing to the existence of these woods you keep a supply of men at work at these small industries that otherwise would not be there?—Certainly they would not be there if the timber was not there.

1673. You say that there has been a considerable amount of interest taken in forestry in recent years?—Yes.

1674. Has that been due to the excursion to Germany for one thing?—I think entirely so far as we practical foresters are concerned. Of course there has been an interest taken by other gentlemen, such as in Edinburgh, from the educational point of view.

1675. Has there been increased interest on the part of the landlords, the land agents and public generally?—I do not know that there is so very much interest there.

1676. Has the influence of that excursion extended beyond the persons who went?—Yes.

1677. In your opinion it would pay to send a number of foresters over to the Continent?—If you do not provide an area to really show how timber ought to be grown, I think you ought to provide the necessary funds to send your foresters into France or Germany to see how it is done there.

1678. And that money might be saved by providing a forest in this country?—Yes.

1679. You are quite certain that it is absolutely necessary, if interest is to be kept up in forestry, that some means should be taken to provide education for foresters by means of object lessons?—Yes, and if you are to grow good timber.

1680. As a rule, taking Scotland as a whole, is it the forester or the land agent that has the most influence over the woods?—On a great many of the estates in Scotland it is the lawyer in Edinburgh who says "You must sell a certain amount of timber, or, at any rate, you must fetch me so much money," and you have to get it.

1681. It is the agent then, and very often an agent who has no sympathy with forestry at all?—He does not know anything about it sometimes.

1682. (*Mr. Lewis.*) Have you paid any attention to the question of the timber supply of the world as a whole; do you consider that the timber we import from abroad is likely in the course of time to considerably diminish?—I do not think it will be very long before it diminishes considerably. I find that the broader sizes of scantlings which used to be obtained some 15 or 20 years ago cannot be had to-day of the same quality.

1683. You regard that as an indication that the supply of timber from which the scantlings were obtained 18 or 20 years ago has become exhausted?—Yes.

1684. And you consider that to be a sign that those portions of the world which are within easy access of rivers are becoming denuded of trees?—That is so.

1685. And that, therefore, there is some prospect that the price of timber may rise in this country?—Yes.

1686. Do you consider that there are large areas of land suitable for afforestation which are not forests at the present moment in that portion of the country with which you have the greatest experience?—There are very large areas.

1687. Do you think that if those portions of land were afforested it would add to the beauty of the country?—It would certainly add to the beauty.

1688. And add to its attractiveness generally?—Yes. It would add to its beauty, and it would add to the labour provided for the inhabitants.

1689. You are in favour of the establishment of State forests to serve as object-lessons to foresters in this country. Do you consider that it would be desirable to have more than one such forest, if possible?—One for Scotland would be quite enough I think.

1690. You consider that the practical instruction given by the inspection of actual results obtained, particularly in countries like Germany and France, is of more value than theoretical teaching?—Without the object-lesson, the theoretical teaching I think has not the effect.

1691. Do you think it would be desirable to organise what one might call assisted tours of foresters in parts of the Continent in which the science and practice of forestry has been carried to a very high and successful point; do you think that that would have a good effect upon foresters generally in this country?—Yes, but I think the forest area would have a far better effect upon the landed proprietors. Unless you can get them to come, even supposing the forester knows how to do it, the forester's education is of very little use.

1692. You think that a beginning should be made with those who have the command of the necessary resources to enable the forester to carry out his work?—Yes.

1693. (*Dr. Schlich.*) I think you told us that you are managing at present 15,000 acres of forest which contain a certain amount of larch, Scots pine, etc.?—Yes.

1694. I think you also told us that the action of yourself from year to year is principally dependent upon the instructions which you receive from the factor?—No, I did not.

1695. For instance, with regard to the cuttings?—I mentioned that as a general practice throughout Scotland, but there are exceptions. For instance, I make the recommendation, and then if my employer or agent agree to it it is done.

1696. And if he does not agree to it?—Then it is not done.

1697. So that practically it depends on what the factor decides or what the factor in conjunction with the proprietor decides?—Yes.

1698. You also told us that very few of the factors understand anything about the forestry business?—There are exceptions, but the majority do not.

1699. I am speaking generally?—Speaking generally the majority do not.

1700. The question of the cuttings is decided from year to year, is it not. You make your proposals every year, and then it is decided what shall be cut in the next year?—So far as the Sutherland estates are concerned I have to make an estimate at the end of each year of what I am going to sell, and what I am going to spend.

1701. You do not make it for 10 or 20 years ahead?—No.

1702. You make your estimate year by year?—Yes.

1703. Are there very great changes from year to year in the quantities of timber which you cut?—No, not since we have got clear of the blown timber.

1704. But in other estates with which you are acquainted, are not there great changes from year to year?—Yes, on other estates which I know they clear off a large area one year, and perhaps if they do not require any money they will not clear anything for another year or two.

1705. And sometimes it occurs that in consequence there is very little more to cut, and you must stop for a number of years?—I am afraid that is the case in a great many instances.

1706. Do you think that this irregularity in the cuttings from year to year has a good effect upon the timber market?—I do not know that it has.

1707. You think there is not much difference?—No. The class of timber we have competes with foreign timber, and there is always plenty of outlet for the supply we have.

1708. Is not it your experience that a good many merchants prefer, as they cannot exactly rely on getting timber locally, to make arrangements beforehand for foreign timber? The timber merchant says "I shall probably require next year, say, 10,000 tons of timber; I do not know whether on the estate within easy reach of me they mean to cut timber or not, and I should be much safer if I made my arrangements at once, and buy it in Sweden, Norway, Russia, or Canada." Does not that often occur?—It does.

1709. That being so, do not you think that it must have a bad effect on the price of home-grown timber? If the timber merchant has made his arrangements, and a certain quantity of timber is thrown on the market locally, does it not occur to you that he would not take it unless he could get it at a very low price?—That is so, but I think what lowers the price more is the quality.

1710. Are you sure of that?—I rather think so.

1711. Do not you think it would be possible to make far better arrangements for working up the timber, for transport and everything if about the same quantity of wood was cut every year on the estate?—Certainly.

1712. That would be a very important item in the amount of expenses of working out timber, would not it?—Yes.

1713. It would considerably reduce the expenditure, would not it, in working up if you could have more permanent saw mills, and if you have traction engines or other means of traction. If you knew that you would get about the same amount of timber every year you could work it out at a reduced rate per cubic foot or per ton; is not that so?—Yes.

1714. Do not you think that for all these reasons it is highly desirable that, especially on large estates and even on small estates, there should always be a plan or a working scheme laying down the working for a series of years, so that the surrounding timber merchants know exactly what wood is coming on the market; would not that have a beneficial effect on the price of timber?—It certainly would, and it would be better for all parties.

1715. If you make a plan for a number of years ahead, would not it require a considerable amount of technical knowledge to hit upon the right thing?—It would.

1716. Do not you think that in order to have that knowledge those who make the plans or the working schemes should have a thorough training in the art of forestry?—Yes, certainly.

1717. In other words, you agree that in order to introduce systematic and regular management the people who prepare these working schemes for a number of years ahead require a thorough training, and require to be experienced in the business, and to be thoroughly acquainted with all the requirements which influence profitable management?—Yes, combined with the local knowledge.

1718. Do you think they can get that knowledge at present locally?—Certainly not.

1719. What do they require for the purpose; do you require special institutions?—Yes.

1720. What we call forest schools?—Yes.

1721. If you had to decide on the training of men who, for instance, would ultimately occupy a position like the one which you occupy, what would you suggest

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as the course of training? I suppose you did not occupy the position you now do at the beginning of your career?—No.

1722. You gradually worked your way up?—Yes.

1723. I suppose it took you a considerable number of years to arrive at the position you hold now?—It took me all my life.

1724. You acquired your knowledge by just beginning as a workman in the forest or woodman?—As a boy planting.

1725. With a spade and so on?—Yes, handling plants in the planting season.

1726. How many years has it taken you to become thoroughly efficient, to manage the estate like the one which you now have charge of—25 years?—30 years.

1727. Supposing you had had at your disposal at starting as a young man the means of instruction at a properly equipped forest school, connected with practical work, do not you think you could have acquired that knowledge in a far shorter period of time?—I certainly should.

1728. Do you believe that the establishment of properly equipped forest schools in connection with practical instruction would be the means of saving an immense amount of time?—Yes.

1729. You would be quicker in a position to manage an estate?—Certainly.

1730. That being so, are you not very much in favour of a very considerable extension of the instructional means available for young men who want to devote themselves to the profession which you follow?—Certainly that is necessary; but there is one thing I always feel a doubt about—as to where they are to get employment.

1731. That, of course, is quite true; you are quite right, but that was not the point I was making at the present moment. I understand that it has taken you, as a practical forester, 30 years to make yourself proficient, by means of which you have reached as good a position as a forester in Scotland as it was possible to attain to?—Yes.

1732. I want you to tell me openly and frankly whether you think you would have arrived at the same amount of knowledge in perhaps a quarter of the time, or a third of the time, if you had had better means of instruction when you were young?—I most certainly would.

1733. Therefore it is of great importance that we should provide proper means of instruction?—Yes.

1734. At the same time you lay great importance on the practical part of the instruction, do not you?—I do.

1735. Would you have the practical instruction before you went to a forest school, or would you go first to a forest school and then take the practical instruction?—If it was possible to have them together it would be better.

1736. If you had a son and you wished to make him a forest manager, would you send him straight to a forest school where he could have a theoretical and practical instruction at the same time together?—Yes.

1737. You would not prefer his being sent for a year or two to a thoroughly competent wood manager, say, like yourself, before he received his theoretical instruction?—I would prefer to have the education, theoretical and practical, going on together.

1738. Have you any idea as to how that is possible?—It is not possible without an area.

1739. Take, for instance, Scotland; you could not have an area at Edinburgh. Would you give the theoretical instruction in Edinburgh and the practical instruction in an area which may be some distance from Edinburgh?—Yes.

1740. Or, instead of having the theoretical instruction in Edinburgh and the practical instruction in an area which is some distance away from the town (because there would be the going to and fro), would you have the theoretical and practical instruction combined in an area somewhere away from Edinburgh?—I do not mean necessarily that you should have the area just outside Edinburgh. You could give the theoretical practice in Edinburgh, and then go out once or twice, or so many times a month to show really what had been taught on the ground.

1741. You might have it in a different way. For instance, you might spend a certain portion of the year in Edinburgh for theoretical instruction, and the other part of the year in the forest?—Yes.

1742. I suppose you admit that the man in charge of the area must be a thoroughly competent forester, do not you?—Yes, he must.

1743. And a great deal depends on whether the man in charge of the forest is a thoroughly competent forester?—Yes.

1744. Apart from the theoretical instruction in Edinburgh?—Yes.

1745. (*Colonel Bailey.*) You said in answer to Prof. Campbell that there were considerable areas of land in the neighbourhood in which you are now employed that are available and suitable for the extension of the forest area?—I do not think I said available; I said suitable.

1746. I meant available from suitability. Can you tell we what are the revenues derived from such lands for shooting and grazing; what are they worth to the proprietor now without any crops of wood growing upon them?—They average, I should say, from 1s. to 2s. 6d.

1747. Is that all the owner gets out of them?—I think so.

1748. That is the nearest estimate you can make?—Yes.

1749. I gather from what you have said that you think that at present, even in the case of woods that are grown more for profit than anything else, the management has not been in the past all that it might have been?—No.

1750. May I ask you to tell us what are the principal faults that you find in it?—Over-thinning.

1751. Can you name any other?—Over-thinning is really the principal fault.

1752. Do the crops generally have an age fixed beforehand at which they are to be cut, or is it not the case that they are just cut at any time that may suit the proprietor?—On a great many estates they are cut when the money is required.

1753. That is to say, there is no fixed, definite idea beforehand of growing the trees of a particular size or a particular quality?—No.

1754. Do you find that it is sometimes the case, particularly in hard wood crops, that thinnings are made again and again until the stock is reduced very much below the amount that it ought to be?—In nearly all cases that is so.

1755. Until in the end, when the trees have become 60 or 70 years old, there is a very poor crop upon the ground?—In many cases there is not a quarter crop.

1756. And very often, when the crop has perhaps been reduced to a quarter of what it should be, do you find the trees are of a good quality?—No, they are rough.

1757. Has not that condition arisen very frequently from the practice of making thinnings and, taking out the best trees instead of the worst; do not they take out the trees which are most marketable and worth the most at the moment?—In many cases that is so, but even in taking out the worst trees they have over-thinned in a great many cases.

1758. In thinning would you not think it was a better plan to look to the formation of a final crop of high excellence rather than to take out good, well-shaped, half-grown trees?—Yes.

1759. That principle has not by any means guided the management in the past?—No.

1760. To that you attribute, partially at any rate, the very poor condition of some of the older woods—over-thinning and taking out the wrong class of trees?—Some of the really old woods are the best woods we have in this country.

1761. Some of them are, but is it not the case that some of the woods are in the condition we have been talking about?—Yes.

1762. Is not there another cause of failure, namely, the failure to replace vacancies as they occur in the young plantations? Is it not the case that in a great many plantations of, say, a dozen years or so, the vacancies caused by rabbits have not been filled up at the proper time, and the consequence is that you have on the ground a crop of young trees of poor quality?—That is so.

1763. Due to the fact that the vacancies were not filled up?—That is so.

1764. You said that if a better system of management were introduced it would result, in your opinion, in the production of a better class of timber. Is it not your opinion, also, that in addition to getting a better class of timber on the ground you would get much more of it?—Certainly you would.

1765. The result of this, I understand, may be taken to be that you have on the ground, in a great many places at any rate, timber of a poor quality and too little of it?—That is so.

1766. And that the estates are managed without any sort of system, that you have probably on very few estates a proper gradation of ages so as to enable you to cut regularly from year to year crops of a certain age?—That is certainly the case in many estates, but on a good many also they are so thin that there is very little chance of cutting any more without clearing off the whole.

1767. You said in answer to a question that although the area covered by woods on your employer's land had not been reduced the growing stock had been very much reduced?—Do you refer to the Sutherland land?

1768. I think you said so; you said the number of cubic feet had been reduced?—That does not refer to the Sutherland land, but to the north of Scotland generally.

1769. The growing stock has been very much reduced in the north of Scotland generally?—That is so.

1770. Do you know any estates in the north of Scotland where it will be impossible to continue cuttings regularly, where there is only matured timber, or timber fit for the market, to last for a few years only, and that then there will be a considerable interval during which it will be impossible to cut anything?—There are many such estates.

1771. I would ask you, in conclusion of this point, whether, in view of these facts, that you could grow a much better class of timber and very much more of it, that there is no sort of organisation, that the age gradations do not exist, and that the stock has been so much reduced that there is only enough timber standing on the ground to provide for a few years' fellings, it can be expected that forestry worked as at present would pay?—No.

1772. Do you think that the figures given relating to such management can be taken as any sort of guide as to what might happen if the management was improved?—The present figures, except for exceptional areas, probably would be no guide.

1773. Taking the north of Scotland generally, do you think the results would fairly represent the returns which might be expected from the land if the system was altered?—If you take it over Scotland generally they certainly would not.

1774. Do you suffer from wind?—Yes.

1775. Trees are blown?—Yes.

1776. Are any sort of precautions taken to prevent loss by blown trees?—No precautions.

1777. Not by growing special belts or felling in special ways? Do not they preserve the outside trees of the older woods so that they may shelter the inner trees?—The gale of 1893 got through all shelter belts and cleared the thing entirely before it, shelter belts and all.

1778. Have you ever heard it objected that if a regular system of forestry were introduced the crops would look so formal that the beauty of the country would be destroyed?—I have not heard that.

1779. Do you not think that, supposing a proprietor wished to retain the wild beauty of the woods growing round his house and along the carriage drive leading up to it, that might be arranged for by leaving comparatively narrow belts on either side of such roads, while the ground 50 or 100 yards inside might be managed on a regular system, and that by so doing the wild nature of the scenery would not be interfered with?—I think the whole of the park area could be left practically as it is.

1780. Practically on most estates there is a considerable amount of the existing wood land, apart from the blank areas, that might be planted upon, which could be brought under systematic management without in any way destroying the beauty of the country?—Certainly.

1781. You said you thought one State area would be sufficient for Scotland. In what part of the country would you put that area?—I am afraid we shall have to take it where we can get it.

1782. Do you think any one area you could get would be fairly representative of all the ground of Scotland, the Highlands and Lowlands?—If you had such an area as I speak of, Skibo, I think it would be a very suitable area.

1783. You would get everything there?—Yes; you could grow all kinds of hard woods and conifers.

1784. (*Sir John Rolleston.*) Is your experience confined to Scotland?—As a forester, yes.

1785. I think you said there was too much cutting and too little planting in Scotland?—That is so generally.

1786. Forestry then is neglected even now in Scotland?—Yes.

1787. You mentioned the expression "suitable land." In your experience would you kindly tell me what is suitable land for planting?—I am afraid my theoretical training is not sufficient to tell you that, but if I saw you on the ground I would tell you what to grow.

1788. Lord Glanusk, who was a witness before you, made a money calculation of suitable ground; he said that any land on which 5s. an acre could be made should not be planted?—I think I am inclined to agree with him. If it fetched 5s. an acre for grazing or any other purpose I would not plant it.

1789. Land that is not suitable for cultivation will grow very good timber, will not it?—Yes.

1790. Could not better crops of timber be grown on better land?—I think the finest crops of timber that I have seen in Scotland were grown on land that you could not cultivate.

1791. There would be no better result from planting in good land than from planting in what you call bad land—land that you cannot get much rent for?—The hillsides, which you cannot cultivate, are good land for timber growing, but bad land for cultivation. It is there you get the finest class of timber.

1792. On land that you could not cultivate?—Yes.

1793. It is a happy provision of Nature, is it not?—Yes.

1794. A crop of timber will grow where cereals and pasturage will not grow?—That is so.

1795. (*Mr. Marshall.*) I believe you are on the Duke of Sutherland's estate in Scotland?—Yes.

1796. I think I remember a great many years ago, in the old Duke's time, a large amount of money was spent by the Duke in steam cultivation?—Yes.

1797. For the purpose of planting?—Not for planting: for agricultural purposes. Considerable areas surrounding the areas that were steam-ploughed were planted, but they were all shelter belts, mostly in peat and on very rocky soil; in fact, there was no soil, and a great deal has not done at all.

1798. With regard to growing larch, is it your experience that the larch disease is gaining ground in Scotland?—No; I am rather inclined to think it is on the decrease.

1799. In your experience is a mixed plantation of larch with other things less liable to disease than a pure larch plantation?—I am inclined to think it is; I have pure larch plantations, and there is very little disease.

1800. Of course the disease always attacks the weakly trees?—No, that is not so.

1801. Do not you notice that if the tree has been hurt in brushing, or the bark has been damaged at all, the disease will attack that tree before it will attack a more healthy tree standing near it?—No.

1802. You think that all larch alike, whether healthy or unhealthy, is liable to the disease?—Not all larch. I am inclined to think that larch grown from imported seed is less liable to blister than home-sown seed.

1803. Have you had any experience of the new larches?—Yes, I have had some.

1804. Do you think it is likely to be a useful tree?—It is a very fast grower, and it has no blister as far as I see.

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1805. What is the greatest age that you have seen them at so far?—About 18 to 20 feet high.

1806. That would be seven or eight years old, or not quite so much?—About six years, I should think.

1807. (*Dr. Somerville.*) You have a large experience, I suppose, of Highland land generally?—Yes.

1808. I suppose that Highland sheep farms are rather an unprofitable undertaking just now?—Yes, they are on the wane.

1809. They have been on the down grade for a considerable number of years?—They have.

1810. I suppose the number of sheep that these Highland farms will keep varies enormously per acre?—Yes, that is so.

1811. I suppose none of these Highland farms are so good as to keep a sheep to the acre?—I am not very well versed in that subject; I would rather not say. I have not gone into the question of sheep farming.

1812. It is a matter of statistics, and I think if we look up the tables we shall find that in a good many cases it requires even as much as three or four acres to keep a sheep?—I have heard it said that it took six acres in Sutherland, but I cannot vouch for the correctness of the information.

1813. I think you are probably pretty nearly correct, and just by way of calculation, we will say that a large quantity of Highland hills will only keep one sheep on, say, five acres, you say six, but we will say five to facilitate calculation. That means that 5,000 acres will only keep 1,000 sheep?—Yes.

1814. Have you any idea of the rent of Highland sheep land? Have you ever heard that there is plenty of Highland sheep land rented at 2s. a sheep?—No, I cannot go into that question.

1815. I know in point of fact that 2s. a sheep is considered a good rent nowadays for a large quantity of Highland sheep land. At 2s. a sheep a thousand sheep would represent a rent of £100 a year, and these 1,000 sheep would occupy 5,000 acres of land, so that a great deal of land is rented at the rate of £100 for 5,000 acres, which works out at about 6d. an acre. I suppose that a great deal of this sheep land is quite suitable for planting trees, is it not?—Very large areas are suitable for planting, but you must not understand that you could plant indiscriminately.

1816. I quite understand that judgment has to be used in selecting the land. Is it within your knowledge that a thousand sheep can be looked after by one shepherd?—I am afraid that is rather too much; he could look after about 500, I should think.

1817. Very well, we will say 500; so that, according to the usual run of things in the Highlands, 500 sheep would occupy about 2,500 acres, and you would have one man employed to 2,500 acres at sheep farming. You say that if land is put under forestry there is about £1 an acre expended on wages per annum?—That is if you have a regular succession of crops.

1818. If you had, in fact, a thousand acres where your trees varied in age from one up to 100 years, your wage bill on those 1,000 acres would be £1,000 a year?—Yes, the wage bill of the expenditure. I include the transport from the wood to the consumer, so that there would be probably freights and railway rates included.

1819. I thought you said that £1 an acre was the amount of wages that the maintenance of the forest, including planting, thinning, and felling, would entail?—What I wanted to say was what an acre of good timber for manufacturing and sending to the consumer really cost at the last clear felling.

1820. You did not take account of planting?—I estimated that; of course, I was not there.

1821. Would you consider now, if you took a moderate estimate, that a thousand acres of forest would employ ten permanent foresters?—If you had it, as you say, on a regular rotation I should say it would.

1822. One man per 100 acres of forest would be a reasonable allowance?—Yes, I think so.

1823. But under sheep farming we only have one man to 2,500 acres?—I would rather leave the sheep farming alone.

1824. It is extremely important that we should have evidence on the effect of Highland sheep farming on the population, and I suggest this figure, which you consider is fairly reasonable. Drawing on your own experience, and taking the case of farms you know, do you think that 10,000 acres of sheep farm in Sutherland would be looked after by about four shepherds?—In some cases 30,000 acres are looked after by four shepherds. But I would not like this to go as being my evidence; I am not well versed in the subject.

1825. I will not press you on the point then; I will only say that it is a common belief that 2,500 acres of sheep land are looked after by one shepherd, and you, from your own experience, say that if the same land was under forestry it would employ one man to 100 acres; that is to say, it would employ 25 men in place of one, with their families. Then in answer to a question from the Chairman you said that netting in forests or plantations against rabbits entailed an extra expenditure of 3d. a yard?—Yes, about that.

1826. I suppose in making that calculation you did not take into account the fact that you would be able to dispense with about three wires if you put on good strong netting?—I did; you will find that good strong netting just now is very expensive.

1827. How much does it run to per yard?—If you get No. 16 gauge I think it will run pretty nearly 3d., or perhaps over 3d., a yard just now.

1828. But you would be able to dispense, would you not, with three wires of the fence?—Yes.

1829. And the three wires per yard would run to about a penny, so that you would take a penny off your 3d. and say it was more like 2d.?—You can practically only do with two wires less, because if the rabbits are very numerous outside you have to put an extra wire to carry the piece of the netting to hang over to keep the rabbits from climbing in.

1830. You say that it costs about 5d. a yard to put up a sufficient fence against sheep?—About that.

1831. Is that with posts 16ft. apart?—No, you could have them closer; I put them from 8ft. to 10ft. apart.

1832. Would posts at 8ft. or 10ft. apart be close enough to put rabbit netting on to?—Yes; you put wooden droppers between.

1833. You can put netting on to droppers on what is known as the Corrymony system of fencing?—Yes.

1834. We have had evidence before us of the cost of planting. What do you reckon it costs you to plant an acre, only taking account of the plants and labour?—It depends very much upon the subject. If you have a subject where there is short herbage, where you can use, say, two years seedlings, or two years and one year planted trees, you can do it much cheaper than you can if you do it with four or five or six year old plants, where you have to make pits.

1835. In the case of the Highland hills the trees are more frequently three years old than six or seven years old, are they not?—Yes. Plants and planting, in ordinary seasons, when plants are to be had reasonably, can be done for about 25s. or 30s. an acre.

1836. That is supplying the plants and the labour?—Yes, putting in something over 4,000 plants an acre.

1837. Do you generally plant by means of the T notch?—Yes.

1838. The planter is accompanied by a boy, I suppose?—If a boy is to be had, but where there is no boy to be had I make the men carry the plants in a bag by their side.

1839. How many plants do you reckon that a man could put in in a ten hours' day?—I have seen men put in 1,500 a day, but I will take it as a general thing from 800 to 1,000.

1840. You would say that 1,000 would be a good allowance?—Yes.

1841. We have been told that in Wales men can only put in 400 a day, so that evidently there must be something different in the conditions there?—Yes; they were probably big plants.

1842. Four-year-old plants?—I am speaking of putting in small plants.

1843. Three-year-old plants, two years' seedlings once transplanted?—Yes.

1844. Do you do anything in the north with a planting iron?—No.

1845. You have never seen anything but a spade employed?—I have seen a planting iron, but I do not care much for it.

1846. How old was the wood in Inverness that you say was prematurely sold at £11 an acre?—From 35 to 45 years old.

1847. Mixed conifers was it?—Principally Scotch fir.

1848. Was the price of £11 an acre due to the poor growth, to the thin stocking, or to the lack of material?—I think there was enough material perhaps for the £11, but it was of a rather rough quality.

1849. (*Professor Campbell.*) You are giving evidence, are you not, on behalf of the Royal Scottish Arboricultural Society?—Yes.

1850. Of course the details are your own, but the general evidence is given on behalf of that society?—Yes.

1851. On their behalf you would say that forestry is very much neglected in this country?—I would.

1852. That there is a want of proper methods?—That is so.

1853. That forestry is a State question, it concerns the State as well as the individual, and that it should have State aid—I mean so far as education is concerned there should be State aid?—I think it is a State question nearly altogether, that the State should really do something in the way of afforesting large areas of our country.

1854. At any rate, there should be State aid?—Yes.

1855. You also agree that there has been a large increase of interest of recent years in forestry, mainly due to the activity of your society?—Yes, that is so.

1856. That there has been a greater spread of literature on the subject?—Yes.

1857. That this increase of interest has done very much to benefit forestry as far as it has gone?—Yes.

1858. That there is urgent need for greater increase of interest?—Yes, very much.

1859. That this could be obtained by State-controlled forests as an object-lesson to foresters?—Yes.

1860. And that a forest school would be desirable?—Yes.

1861. I suppose that the education given there should be cheap, so that it could be availed of by foresters?—Yes.

1862. That is essential, is it not, because the rate of remuneration given to foresters is not sufficient to enable them to pay high fees?—That is certainly so.

1863. (*Colonel Bailey.*) Are you aware that the views you have expressed have been embodied in a pamphlet by the Arboricultural Society and presented by a deputation to the Minister of Agriculture?—Yes.

1864. You knew about that pamphlet?—Yes.

1865. Are you aware that two deputations have approached the Minister of Agriculture, when they have laid the matter before him with this pamphlet?—Yes.

1866. (*Chairman.*) You gave evidence, I believe, before the Deer Forests Commission?—Yes.

1867. Supplementing what Professor Campbell has asked, I believe you there gave in evidence that the planting on forest lands in the Highlands of Scotland is essentially a Government question?—Yes.

1868. You do not think that there will be extension of the existing timber area by private initiative?—No. I think the landed proprietors feel there is a likelihood of Government stepping in and interfering with the management of land, so that they cannot see their way to invest money in it. That is one reason. Another is that a great many of the landowners, in Scotland particularly, have not got the money.

1869. The chief reason is that they have not got the money to do it?—Yes.

1870. And that it will take all the resources they have to improve the existing wood land?—Yes.

1871. Therefore if there is to be an extension of the timber area in the Highlands, and with it the opportunity of labour for the population, it is to State action that you have to look?—I think so.

1872. You said in your evidence before the Deer Forests Commission that there were over five million acres of waste land in the northern counties of Scotland very well adapted for growing timber?—Yes.

1873. You agree that there is a very large area there?—Yes.

1874. The waste land in the United Kingdom, together with rough pasture, is put at 16 or 17 million acres; do you think it advisable to have an expert committee to decide the area available for planting?—Yes; if you mean to do anything you would require to have experts to select the areas that were suitable for planting.

1875. They would do that; but to settle the question of whether or not there is much waste land that could be profitably afforested, you would favour the appointment of an expert committee to decide what portions of the waste lands in the United Kingdom were suited for timber growing?—Yes, if there is any doubt upon the matter; as far as I am concerned there is none.

1876. Are you in general agreement that there is a very large area of land available for profitable sylviculture?—Yes, I think it is generally agreed that there is a large area.

1877. But there is sufficient doubt and a sufficient lack of initiative on the part of the Government to render it desirable to have the point cleared up?—Yes, I should say so.

1878. You mentioned in your evidence before the Deer Forests Commission that in the parishes of Alness and Kiltearn in Ross-shire there were, in your estimate, about 25,000 acres of land under sheep which would be capable of growing timber profitably?—Yes.

1879. Dr. Somerville asked you some questions as to the relative amount of employment afforded by timber growing, and by sheep pasture. You know those parishes and you probably know a sheep farm in them, which used to be of about 14,000 acres, 4,000 of which were under timber. On the 14,000 acres how many shepherds were employed, 5 or 6 or 7?—Not quite as many as that.

1880. Say half-dozen?—Yes.

1881. That would be a liberal estimate?—Yes.

1882. When you managed the timber area of 4,000 acres how many men on the average did you have on the timber portion?—They ran from 100 up to over 200 sometimes.

1883. The figures that you have given include all operations, including the big blow of timber at the time?—Yes, during the big blow there would be over 200 men employed.

1884. That shows that a small section of a sheep farm that happened to be under mature wood yielded in your knowledge for many years many times the amount of employment that the pasture land afforded?—Oh yes.

1885. Are many foresters' sons foresters? Do many of the foresters' children follow their fathers' profession?—Not very many that I know of; I know perhaps half-dozen throughout Scotland.

1886. In certain districts of the country might not there be some training for children in botany and elementary knowledge connected with forestry in the primary schools?—Yes, certainly.

1887. You think that would be a good thing?—Yes, I think that is very necessary.

1888. As to getting education for men like yourself, leading foresters, who have to work their way up from the start, your idea is that the young man would have to be able to earn his living whilst he was acquiring his knowledge, unless there were bursaries provided?—That is so.

1889. You would make him work in a Government area?—Yes.

1890. Therefore the perfect system for him would be to have a forest school on that area, so that he could work during the day and take his instruction in the evening in the form of a continuation school?—That would be a better idea.

1891. But for owners and factors, the University classes, with expeditions to the experimental areas, might be the more effective method?—Yes.

1892. So it is possible that two systems might be needed in order to thoroughly meet all requirements?—Yes. I think really what would do most good would be if the agents and land-owners were got at.

1893. That was why I was asking those questions about their education?—When you have got them, and also have given a little assistance to the working forester, you would very much improve the working.

Mr. D. Robertson.

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1894. (*Professor Campbell.*) That is the general view of the members of your society as well?—Yes, I think so.

1895. (*Chairman.*) When you say that land may produce 20s. an acre of profit, which could go into the owners' pocket for the employment of labour, that would include planting, fencing, thinning, draining, cutting, transport, and manufacturing on the ground?—I think the 20s. only included the labour employed in manufacturing and disposing of the felling. I think the estimate I made came to 30s. per acre, if you took the others. The last clear-felling of a mature crop of timber gave 20s. per acre per year to labour for manufacturing and sending to the consumer; but I estimate that labour got 30s. per year if you include everything from the time it was planted until clear-felled at 60 years old.

1896. In your evidence before the Highland Deer Forests Commission I think you said, "Now, if by planting this land it could be made to yield 3s. to 5s. per acre of yearly clear rental, besides giving from 15s. to 30s. per acre per year to the working classes, is it not the duty of the Government to at least give it a fair trial"?—Yes.

Mr. J. Davidson.

Mr. JOHN DAVIDSON, Secretary to the English Aboriculturai Society, called; and Examined.

1897. (*Chairman.*) I observe that you have a scheme of examination for a certificate of proficiency in forestry?—Yes.

1898. Do you find that that is much taken advantage of?—I am sorry to say it is not.

1899. Do you think that diplomas are much valued by owners of woodlands in selecting foresters?—I do not think they have come to that yet.

1900. Have you been abroad yourself?—No.

1901. Do you find that the annual excursions at home do considerable good to foresters?—Yes; they are very instructive.

1902. Do you think that the existing forests in England are being depleted?—I should not say the existing ones, but those that have existed perhaps 200 or 300 years—at least there is evidence I think that they have disappeared altogether.

1903. You think that now forestry is holding its own in point of area?—I think so as far as my observation goes.

1904. And are the plantations improving or deteriorating?—I think there is more interest taken in them than there used to be years ago.

1905. Are they being improved?—I think so; there is more planting.

1906. But you think there should be an extension of forestry in order to take the place of the forests that have disappeared?—Yes, that is my opinion.

1907. Do you think it would pay?—In the end it would pay; in fact, it would pay within a certain number of years. Perhaps not directly, but indirectly.

1908. A well-grown wood will give a return on the land that it occupies, will it not?—Yes.

1909. Provided that the trees suit the soils?—Quite so, and that the other conditions are favourable.

1910. You would like to put forestry on a business footing?—Yes.

1911. And you do not think it is on that footing now?—Not as a whole. There may be isolated cases where it is treated commercially, but not as a whole.

1912. Do you think there should be a system of State forests in this country?—Yes, I think it would be an advantage.

1913. You do not think the extension of the existing area will be effected by private owners?—I am afraid not.

1914. And you think one or more of these forests should be available as demonstration areas where experiments could be tried, and the training of foresters could be conducted?—Yes, I think it would be a great advantage.

1915. Do you think that the extension of the forest area would help to maintain a country population on the land?—Yes.

1916. You have had some experience, I believe, in growing timber at high altitudes?—Yes.

1917. Can you give us any examples?—Of course we have timber growing upon the estates that I am connected with, very fair, good timber, at about 1,800 feet above the level of the sea.

1918. Where is that?—That is in the neighbourhood of Alston Moor in Cumberland.

1919. (*Mr. Stafford Howard.*) Is that on the Dilston property?—On the Derwentwater property.

1920. (*Chairman.*) What kind of timber is that?—Both larch and Scotch.

1921. And it pays?—Well, of course it may be doubted whether it pays financially, but there is no doubt that it is a very great advantage for a farm. There is a 4,000 acre farm close to it, and it is the only shelter the farmer has got for his sheep. The timber is now ready to cut down, and is worth £20 or £30 an acre.

1922. You are connected with the wood management of the Derwentwater estates. What other estates are you connected with?—No other estates at present.

1923. What is the area of wood land on the Derwentwater estate?—We only have at the present time 500 acres. Great sales have taken place during late years. The area used to be about 4,000 acres.

1924. Are you replanting at all?—We are making new plantations, but not on a very large scale.

1925. Have you any regular system there of cutting, felling, and planting?—We fell as soon as ever the timber is ready, and we take in waste land too, where it is likely to be a shelter to adjoining farms.

1926. Do you manage the wood land on your own initiative?—I manage the whole of the estates; I am the agent of the estates.

1927. Do you do as you think fit with the woods?—Everything is generally done on my advice. I report everything, of course.

1928. Are you planting more than you cut?—At present we are. We have not very much to cut now.

1929. How much are you planting a year?—From ten to twenty acres, I think.

1930. Do you think that proprietors might plant if money was advanced to them by the State?—I think so.

1931. Under what sort of conditions as to supervision?—I think it would be better to have Government supervision.

1932. It would have to be pretty strict, would it not?—Yes. Private proprietors have their sentimental ideas about woods, and sometimes do not just cultivate them at the proper time, or in the proper way.

1933. They have also their ideas about game?—Yes, of course in the high land they are not much troubled with game, except that it is a prevention to grouse shooting. It stops the drives. That is the only disadvantage.

1934. Have you any experience of planting the gathering areas of water companies or corporations?—No.

1935. (*Dr. Somerville.*) You have been secretary, have you not, of the Engish Arboricultural Society for many years?—Yes, since its commencement.

1936. How long has that been?—About twenty-one years.

1937. The society has been established for twenty-one years?—Yes.

1938. Have you noticed during that period that its numbers have increased materially?—Very much so, especially during these last three or four years.

1939. Do you think that interest in forestry has been gradually growing, and that during the last three or four years more particularly it has been increasing considerably?—That is so.

1940. To what do you attribute this increased interest in forestry in this country?—There may be different reasons given for it. I do not know that the society may take to itself any credit for it. I may say that the proprietors looked with some suspicion on the society at first. I think they had an idea that foresters were combining as a kind of labour movement or something:

of that sort; but now that they see it with the pure intention of extending plantations they are taking more interest in it. Of course, a great deal of land during late years has gone out of cultivation, and been laid down to grass; in fact, there is a very large area going back to prairie. Mountain land has deteriorated in value very much, and I think that has been an inducement for proprietors to take up more plantation.

1941. What is the membership of your society now?—At the last annual meeting it was 516.

1942. I suppose that is the largest number the society has yet had, it it not?—Yes.

1943. I suppose that the society undertakes annually excursions to woodland estates?—It does.

1944. And it has not been abroad so far?—No.

1945. But it proposes to go abroad this year, does it not?—Yes, to France.

1946. Do you think that the excursion which the Royal Scottish Arboricultural Society made to the Continent about five or six years ago has had some influence in determining the English society to take a similar course of action?—I think it may have had some slight influence in that direction.

1947. Do you think acquaintance with Continental methods cannot but be an advantage to English forestry?—Quite so. We have now a few more scientific members connected with the society who advocate going further afield.

1948. The English Arboricultural Society holds an examination, and grants certificates in forestry?—Yes.

1949. The Highland Society of Scotland also holds such an examination?—I believe so.

1950. One main difference between these examinations is that the Highland Society's examination is purely theoretical, and I think the English examination is largely practical, is it not?—Yes.

1951. The examination takes the form, partly at least, of putting candidates through an examination in the practical processes of forestry, does it not?—Yes.

1952. They must show skilfulness with the use of the axe, and the spade, and the saw, and ordinary forestry tools?—Yes.

1953. So that I suppose any certificate that would be granted as the result of this examination would be a fair criterion of the practical acquaintance of the candidate with forestry operations?—Yes; it is very important that they should know the practical part of their work.

1954. You say that the number of candidates has not been quite so large as you would like?—It has not.

1955. I suppose that that may be due to some extent to the very searching character of the test that is applied practically?—Yes. The scientific knowledge that they are expected to attain is somewhat difficult for men who have received only a moderate education.

1956. On the other hand, it would be no use I suppose for a student who had gone through a theoretical course of training to present himself for this practical examination?—No.

1957. So that the theorist alone has no chance of passing and the practical man, on the other hand, has no chance of passing, and the result is that we may call it a very searching examination?—Yes. Our society is scattered over a very wide area, and you may get isolated cases where men desire to come up for examination, but it would scarcely do to bring the Committee together unless we had a sufficient number.

1958. What form do you consider education in forestry might best take?—I have an idea that it would be best to have an experimental forest, and to have the teaching there.

1959. You would like to see one or more areas of land acquired by the State, would you not?—Yes.

1960. Which areas should be run on thoroughly practical lines?—Yes.

1961. But at the same time I suppose it would illustrate the various systems of forestry?—That is so.

1962. To do this I suppose the area would have to be of considerable size?—Yes.

1963. What do you think would be sufficient for one of these areas?—Of course, it would depend on the locality. If you go into the higher altitudes, into mountain districts, where you can get land for about 2s. an acre as an annual value, you should not have less than 4,000 or 5,000 acres.

1964. You think 4,000 or 5,000 acres would be a sufficient size for one of these areas?—That is, if the land was judiciously selected. It would not do to take 5,000 or 6,000 acres of moss where, even if the trees grew, the wind would blow them down.

1965. It would be rather desirable to have various types of land represented on such an area, would it not?—It would.

1966. It would be desirable also to have some moss land, and some rocky, bare hillsides?—Yes.

1967. And some land of better quality, of course?—Yes.

1968. Consequently, you would not only advise that the soil should vary, but also that the altitudes should vary considerably?—Yes.

1969. On one of these so-called demonstration areas you would, I presume, suggest that a school of regular forestry instruction should be established for the education of the working forester?—Yes.

1970. I suppose the young working forester is not, as a rule, in a position to pay much in the way of fees?—No, his wages are too low.

1971. How would you get over the difficulty of fees?—There would have to be the same that we have in education, some Government allowance.

1972. Something in the nature of a scholarship?—A free grant, or aid grant, or scholarship.

1973. Did it every occur to you that it might be possible for the student who spent two years more or less at such a school to do a certain amount of work in the woods, and to receive some wages for the time he worked, which wage would be sufficient, at any rate, to pay for his maintenance and education?—I think that might do: but at the present time if virgin land was bought up there would be no woods for him in which to work, say, for 20 or 25 years; or very little, with the exception of repairing fences and generally looking after the land.

1974. And planting trees?—Yes.

1975. But there would be no felling?—No.

1976. Would it not be desirable in securing such an area to attempt to obtain land which contained a certain amount of timber already?—It would be an advantage if you could get it partially wooded, even if it were only a small proportion.

1977. But after the area was in fair working order, I suppose it would be possible then for young men to come to such a school and to obtain theoretical instruction in the afternoons, or during a certain portion of the day, and during the rest of their time to actually take part in the practical operations that were going on, and to receive some remuneration for such work?—Yes.

1978. It is within your knowledge, is it not, that the Northumberland County Council has done something in the way of encouraging education in forestry?—Yes.

1979. Some years ago there were classes for the education of working foresters at Hexham?—Yes.

1980. And those classes were conducted one night of the week during the winter period?—That is so.

1981. Hexham is an important centre for forestry?—Yes.

1982. There are large woods in the neighbourhood and extensive nurseries there?—Yes.

1983. And young men came to work in the nurseries, and in the evening they attended these lectures on forestry?—Yes.

1984. Do you happen to know whether the attendance was fairly satisfactory or not?—I think it was very good.

1985. Good classes were obtained and the interest was kept up?—Yes.

1986. Do you think that such a system might in the meantime, pending the creation of these demonstration forests, be extended by other county councils?—I think so. Of course the Northumberland County Council have some practical experience in growing trees at the farm; but there is this disadvantage, that the nature of the soil is of one kind, and you are confined in your description of trees. There is no variation of the soil which would allow the student to see how different kinds of trees would grow.

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1987. I suppose you have seen these plantations at the Northumberland demonstration farm?—Yes.

1988. Could you describe to the Committee what they consist of?—They are principally experimental plots of Japanese larch, a few pines, and Scotch fir, and the usual larch. Of course they have not been planted for more than 4 or 5 years. The plots seemed to be doing very well. It is a sort of poor clay land all of one kind, not land perhaps that is very well adapted for growing Scotch firs and pines, and those sort of trees, but still they are looking very well, and I believe they are doing very well.

1989. I suppose these blocks of plantation are put down to illustrate certain points in the way of mixtures, different methods of planting, different kinds of trees, and so on?—Yes; and not only that, but the health of the trees as well, which is a very important point at present. The larch disease has deteriorated the plantations very much.

1990. These demonstration plantations that the Northumberland County Council farm I suppose are something like half an acre each?—Yes.

1991. The total area under these plantations being something like 8 or 10 acres?—Yes.

1992. The farm is visited annually, is it not, by large numbers of people?—Yes.

1993. And those who are interested in forestry would naturally turn their attention to an inspection of these demonstration plantations?—Yes, they do so.

1994. In the course of time I suppose it would be possible to see the results of mixing, we will say, beech with larch and silver fir with larch, and the relative merits of the Japanese, German, and Scotch larches?—Yes.

1995. And the relative growth of glaucous and green Douglas firs, and various things of that kind?—Yes.

1996. The land you say is poor, and so far as it goes is quite well adapted for planting, but is it all of the same character?—Yes.

1997. In England there is a large number of these demonstration farms nowadays?—Yes.

1998. Do not you think that that system which has been adopted by the Northumberland County Council might with advantage be carried out by other county councils who have similar farms, but who have not, so far, gone in for any such demonstration plantations?—I think it would be an advantage, because they would have different soils on which to experiment.

1999. It may be also within your knowledge that the Northumberland County Council have not only subsidised instruction in forestry at Hexham and established these demonstration plantations on their experimental farm, but have also granted scholarships to enable young foresters to travel to Newcastle for one day in the week during the whole winter?—I think that was done.

2000. These young foresters were granted scholarships sufficient to cover their railway expenses, and they came into Newcastle and received systematic instruction in the evenings?—Yes.

2001. I suppose that, subject to limitations, these three forms of instruction in forestry which have been subsidised by the Northumberland County Council have done a certain amount of good?—Yes.

2002. They may not take the place of a model forest of a well-equipped forest school, but I suppose you will agree that within their limits they are to be distinctly commended?—Yes, there is no doubt of that.

2003. And, in fact, that other county councils who have not taken these lines might with advantage follow the lead of the Northumberland County Council?—Yes.

2004. I should like to ask you one or two questions as to the relation of population to forest operations. I suppose the land that you recommend for being put under forestry is at present grazing land for the most part?—Yes.

2005. I suppose it is pastoral hill land?—Yes.

2006. And carrying black-faced or Cheviot sheep, as a rule?—Principally.

2007. Do you happen to know how many acres of such hill land it takes to maintain one sheep for a year?—There is such a difference in the land.

2008. I mean the land more particularly adapted for forest purposes?—I think we have a farm of about 4,000 acres, and the stock of sheep is supposed to be 2,000, so that 2 acres would be for one sheep. Then there is a very large quantity of that farm which is moss land, so that is would really take half a dozen acres to feed a sheep.

2009. The number of acres necessary for a sheep in your district of Northumberland would be a great deal less than it would be in the Cheviots?—It may not take more acres I think in our district, because the Cheviot hills are sound, without these great moss breaks.

2010. At any rate, it would take more acres in the Highlands of Scotland to keep a sheep?—Yes.

2011. What is about the rent that is paid by a farmer for sheep?—It will run to about 2s.

2012. He pays about 2s. a sheep?—Yes.

2013. And it takes two acres to keep a sheep; therefore the rent is 1s. per acre per annum?—Yes. I think our tenant would pay less than that, because he lets the shooting for a large sum, and it is all included.

2014. The shooting would not be interfered with by planting?—Grouse shooting would. Grouse do not care for woods.

2015. But, speaking generally, there would be still a fair opportunity for sport?—Yes, there would be still plenty of open tracts.

2016. I may take it from you that this land suitable fo rplanting, is at present rented at something about 1s. an acre?—Yes, with the shooting.

2017. You say it takes two acres to keep a sheep. How many sheep are placed under one shepherd?—I think the man I have spoken about has three shepherds.

2018. Three shepherds on 4,000 acres?—Yes.

2019. We will say then that a shepherd on 1,000 acres would be a liberal allowance?—Yes.

2020. That is the present condition of affairs in pastoral districts. In your district there is, excluding the farmers, a population of about one shepherd per thousand acres?—Yes. They might get an extra man in the lambing season, which, however, is only a month or two.

2021. Do you happen to know what amount of labour a thousand acres of land stocked with trees might maintain?—I was reckoning £5 of labour annually to 20 acres.

2022. That is 4 acres per £1?—Yes, I think that is about what it would cost us.

2023. So that 100 acres would cost £25 a year for labour?—Yes.

2024. That is about half a man's wage?—Yes.

2025. So that it would take about 200 acres of forest land, according to your experience, to maintain one man and his family?—Yes.

2026. But under the system of sheep farming one man and his family can only get subsistence on 1,000 acres?—That is so.

2027. Therefore, even under the unfavourable conditions that prevail in your district, forestry would give the opportunity of maintaining five times the population that pastoral farming does?—Yes. I have some information from the late Receiver of the Greenwich Hospital estates at the time the area of the plantations was 3,000 odd acres. The revenue at that time was £4,000 a year, and the labour, in trades and everything, £1,000 a year, which is a fourth of the revenue.

2028. You have referred in your summary of evidence to the advantage of the State lending money for forestry operations. I suppose you are aware that already there are certain facilities for people who desire to plant borrowing money from Improvement Companies through a certificate of the Board of Agriculture?—Yes. I did a great deal of work 37 years ago with money borrowed from the Improvement Lands Commissioners; but, of course, the rate of interest at that time was 6 per cent., and it could scarcely pay at that.

2029. What would you suggest as a fairly suitable means whereby the State might support forestry?—I think if money could be lent at about 3 per cent. it might be useful.

2030. You think that landlords might borrow money from the State at 3 per cent. and plant trees with it, even although they were aware that for 20 years they

would have to pay out 3 per cent. without getting any sort of return?—Some might, but it is doubtful even whether you would get a very large number to go into it.

2031. I suppose you would suggest that if the State did lend money on planting it would require to inspect the work when it was done and require to keep an eye on the progress of the plantation?—Yes, to see that they were not neglecting the work.

2032. You have referred further to the advantage of planting areas from which water is drawn for the supply of towns. Not very far from where you live there are large reservoirs which supply Newcastle with water?—Yes, and others are being prepared.

2033. Is Newcastle likely to take the line of planting a catchment area?—I do not see why they should not. They have purchased the principal portion of the gathering area, and it is now in their own hands, and I think that the increase of the water supply would be materially assisted by trees and plantations; in fact, the whole water supply of the country would be helped by it.

2034. When a corporation purchases a catchment area or gathering area it generally proceeds to remove all the population from it?—Yes.

2035. To prevent contamination?—Yes, to clear away the stock and cattle as much as possible.

2036. In fact, there are cases, I think, of their not only clearing the population off, but clearing the sheep, stock, and cattle as well?—Yes.

2037. That leaves the area absolutely unutilised except for forestry, does it not?—Yes.

2038. What advantage, then, would tree planting have besides supplying timber; would it have an effect upon the supply of water?—I think it would.

2039. And upon the purity of the water?—I think it would.

2040. It would have an effect upon the supply, I suppose, through the agency of the vegetable matter which would accumulate in the ground sucking up the water and retaining and preventing it running off?—That is so. We have thousands of acres in our neighbourhood, and, no matter how heavy the rainfall may be, it runs off; it is all gone in 24 hours. If there were plantations, the leaves of trees and the branches of trees would retain the water, and through the action of the roots the water would percolate into the ground.

2041. I suppose also that if the water did not rush off so quickly there would not be nearly so much silt carried into the reservoirs and deposited?—No.

2042. And the water would be brought into the reservoirs a great deal purer, and would necessitate much less filtration?—Yes.

2043. (*Sir John Rolleston.*) You practise mainly in the North of England?—Yes.

2044. You have a general knowledge of the whole of England, have not you?—I have been in Wales, in Gloucestershire, in Herefordshire, although I have never done much in forestry except in Wales.

2045. But you have been about with your society?—Yes.

2046. Do you find that as a rule there is too much cutting and too little planting throughout England?—We find it both ways. There is too little cutting in some cases. We never, however, find any fault with too much planting. I think cutting is often neglected to the disadvantage of the plantations.

2047. Do not you think that planting is neglected?—I think so.

2048. Neglected generally throughout England?—Yes, generally I think.

2049. All the witnesses have agreed that it pays commercially to plant land which will not produce a certain rental, and that you may grow timber at a profit on such land. Do you agree with that?—Yes.

2050. Most of the estates in England are residential, are not they?—That is so.

2051. Is not the market value of an estate well furnished with wood more than an estate which is bare of timber?—Yes.

2052. So that, apart from the commercial value of the timber, the fact of its growing in profusion on an estate increases the commercial value of that estate?—It does.

2053. It must be therefore a good investment for trustees of minors and such people to plant in all cases where the estate has been unduly bared of timber?—Yes.

2054. Because, apart from the value of the wood itself, the market value of the estate is increased by the additional beauty, which is always an attraction in a residential estate?—Yes, and the adjoining land is also improved.

2055. From an agricultural point of view?—Yes.

2056. That is a very important point?—Yes. There is another point that we are apt to overlook. There is a farm now on a certain estate of 400 acres, and that farm is to let, but the proprietor wants a certain rent, say £375. The highest offer a tenant has made is only £325. The tenant says that the fences are very bad, and every fence on the farm he has to keep in order. If a certain acreage of that farm was planted, the tenant knows very well that the fencing of the plantation would be kept by the proprietor, and of course he would be prepared to give a better rent. You will find that that will hold good all over the country.

2057. Therefore a landowner may feel that in planting his estate it is not only the return that he is going to get from the plantations themselves, but that at the same time he is improving the capital value of his property?—Yes, he is; and in the neighbourhood of towns he is making very often valuable building sites after the plantations are up.

2058. (*Professor Schlich.*) Your Society examines in forestry, as you have said: where do the men who come up for examination generally get their knowledge of forestry?—They have a certain syllabus put before them, and they have to read up. They are generally men who are on estates, working in woods, who have a kind of rudimentary knowledge of forestry itself. Of course this theoretical part helps them, and then they are put through the course of practical forestry.

2059. Their knowledge is all acquired by private study?—That is so, with the addition of the lectures that were given under the auspices of the County Council.

2060. (*Colonel Bailey.*) Who gave these lectures at Hexham?—Professor Somerville gave some of them.

2061. How many lectures were there?—I think they were given twice a week for one winter, if not two winters.

2062. What classes did you attend?—I am sorry to say that I did not attend one, but some of my sons, I think, attended them.

2063. (*Mr. J. H. Lewis.*) You have had some experience in North Wales, have you not?—Yes, 40 years ago.

2064. In what parts of North Wales?—I have forgotten the name of the estate, but it is three miles from Mold, and there was another estate in Denbighshire.

2065. From your general experience in that part of the country would you be prepared to say that there are portions of it which could be suitably afforested which are not afforested at the present time?—Yes.

2066. I think in your statement you refer to the depletion of foreign stocks; have you given any special attention to that particular question?—I have read a great deal about it.

2067. But has your Society collected any statistics upon the point, or any evidence?—We have information from a great many foreign countries.

2068. Would it be possible to condense that information in the form of a memorandum which might be sent to the Secretary of this Committee?—I think so. Very strange to say, there was a Forestry Association formed in the United States just about the time the English Arboricultural Society commenced, and we have received all the information from the Department of Forestry. There is a Director of Forestry connected with the Department of Agriculture, and the information we have is somewhat voluminous now.

2069. (*Professor Campbell.*) You mentioned that 40 years ago you had experience in forests in North Wales. How do prices compare now for all classes of wood with the prices then?—They are not so good now as they were then. I know we felled a good deal of oak, and the bark has gone back very much. I do not know that the prices are affected so much as the quality of the

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timber. There were a great many larch woods in Wales that I had to do with. Larch wood is at equal value at the present time, when you can get good timber, but in mines, iron and stone mines especially, they complain that this bulged part where the disease attacks them breaks off and will not bear weight.

2070. With regard to other woods, you think the prices are much the same now as they were 40 years ago?—No, the price is not so good.

2071. They have all gone down in price?—Yes.

2072. The prospects are worse in that respect?—There has been a rise lately.

Mr. A. Vernon.

Mr. ARTHUR VERNON, Member of Council of the Surveyors' Institution, Land Agent and Surveyor, called; and Examined

2073. (*Chairman.*) You have had a long experience of a very large number of estates on which there are considerable woodlands?—Yes.

2074. And you have been concerned in planting, especially in the neighbourhood of the Chilterns, where beech woods are valuable?—Yes.

2075. Do you think there has been a considerable reduction in the area of forests in those districts within the last century and a half?—Within the last half century. They were reduced very largely indeed after the high prices of corn, subsequent to the Crimean War.

2076. Do you think that beech succeeds best when it is self-sown?—That we know to be the case. (*Appendix IX.*)

2077. Is natural regeneration the usual process that you follow?—Buckinghamshire has been the home of the beech, and from time immemorial the woods have been self-planted. Beech trees are more flourishing when allowed to follow their own natural habits of self-sowing.

2078. Is that the system followed?—We do all we can to encourage that habit. We remove the undergrowth and rubbish, and provide for the survival of the fittest.

2079. Do you take the woods on the selection system, or by clean cutting?—By a mixture, but the selection system is the dominant feature. As woods differ so much in productive capacity it is impossible to allow them their exact rotation. Taking a thousand acres of beech wood in the Chiltern Hills district, every beech wood differs in its productive capacity according to the situation, the soil, and the management.

2080. Is most of the area covered by the process of natural regeneration or planting?—Almost entirely by the care taken in that indigenous system which I have pointed out. The beech succeeds best when it is self-sown, and beech woods require special treatment. They should be thick enough to exclude cold winds, but must allow for sufficient sunshine and air, or the young growth is much retarded. There is very little artificial planting of beech.

2081. You find that the gross yield varies from 15*s.* in the worst woods to over 2*l.* per acre in the best managed woods, and that the price of beech varies from 8*d.* a cube to about 2*s.* or an average of 1*s.* to 1*s.* 3*d.*?—Yes, that is so.

2082. You find the larch even more profitable?—Larch, which is grown on an entirely different system, can I think at the present moment be made to pay a larger price than any other wood in my experience, provided it is properly planted, kept from depreciation by rabbits, and in a suitable soil, and not in a cold situation.

2083. These larch plantations cost from 6*l.* to 10*l.* per acre for planting and fencing. Do you consider that a high rate for planting?—6*l.* an acre would be cheap. 10*l.* would be above the average. 8*l.* would be the average in my experience.

2084. You do not think it can be done more cheaply than that?—Yes, from 3*l.* to 4*l.* by planting home-reared stock or once-transplanted stock, but I do not think the ultimate result is so quick or so good.

2085. Is it pitting?—They are planted by pitting little holes nine inches or a foot square and about six inches deep, keeping the roots as near the surface as possible, but sufficiently deep to prevent them being disturbed too much by wind.

2086. Do you slip at all?—Yes, for cheap work; but 40 years experience has shown me that a fair amount of expense in starting pays in the long run by results.

2087. You think there is a considerable area of land which could be properly afforested?—I am sure there are many thousands of acres in the counties of Bucks and Oxford and Herts which are only suitable for the growth of timber, and which might with great advantage be brought back again to timber cultivation.

2088. You would get landowners to plant by enabling them to obtain loans?—That is a suggestion I am not able to give a very authoritive opinion upon, but I think that is one way in which landowners would be encouraged. It is a very unselfish thing for landowners in bad times to spend a lot of money in planting, because unless they are very young men they will see no result for their own benefit.

2089. It would have to be under very stringent supervision, would it not, having regard to the amount of ground game in the country?—There would be three great difficulties I think in the loans. They can be only advanced in instalments, the security might be destroyed by the season, by bad management, or by the ravages of game.

2090. You would propose also that new plantations up to 25 years might be left free of rates?—Yes, they were free of rates until the Act re-imposed those rates. That is a very great hardship, that land that is of no productive capacity, but which the prudent landowner has put down in plantations, should be paying rates for 25 years before it returns a penny. It is contrary to what we used to consider the accepted law that he is rated for what is absolutely a non-beneficial occupation.

2091. Would it bear an extra rate during the latter period of its growth to compensate for not having paid during the first part, or at the felling?—I hardly like to say anything on that. I know it is not the stock that is rated. The difficulty would be that under that Act the land is assessed in its natural condition, whether it contains £200 worth of timber per acre, or is a new plantation worth only £10. In one case the owner is deriving a large annual benefit, and in the other he has to wait 25 years at least, before getting any return on the expenditure.

2092. I see that according to your statement you advocate improved methods of teaching forestry and facilities for woodmen to acquire information, together with increased advantage of easy transit, and think these would encourage owners to add to the value of timber culture?—The cost of moving timber on railways is often a very large proportion of the total value per cubic foot. All those advantages would encourage the growth of timber.

2093. How do you think the woodmen themselves could be better trained?—I am not prepared to offer any suggestion, except this: I have a great many woodmen under me, and I think that painstaking instruction of skilled agents is the only way in which I can see they could be trained.

2094. Do you think the owners and agents should have greater opportunities for acquiring a more technical knowledge of the management than woodmen?—I think they should. I mean that the best woodmen are generally those who have been woodmen for generations. I do not think they can all be taught. A good woodman is generally too old now to be taught; he will obey instructions, but is absolutely beyond theoretical teaching.

2095. Have you had any experience of timber growing beyond beech woods and larch plantations?—I have in many counties in England, but that is the largest practice I have, and on which I think I might offer suggestions to you with more advantage than with regard to other timbers.

2096. Where the beech is grown in these particular districts you think that the local knowledge is sufficient without providing additional facilities for education?—No, I do not. We have some of the best woods in the kingdom on a small scale. The Indian Woods Department come over occasionally to see them, and we have been able to show them beech woods in perfect condition as we think, free from rubbish, containing

young trees, middle-aged trees, and old mast-bearing trees, which are ripe for cutting. We think that beech woods should contain trees always to the maximum cubic capacity possible, and in such a period of succession that they might be cut at regular intervals without lessening the annual quantity. If we find, like we do in some of the French forests, that there is nothing but very big trees, we know that that is rearing of capital without any benefit until it is cut. It is a crop and not a succession of crops. If we find bad undergrowth, ruined by rubbish, and not properly cleared, we know there is no attention being paid to it, and that the succession of crops is being destroyed.

2097. I see that in the last page or two of your suggested evidence you give various reasons why you think education is necessary. You think that as far as the facilities for acquiring a thorough knowledge of the management of woodland are concerned, the State could aid, and you think it is more important to provide for the needs of the estate agents than for the woodmen. The woodmen would take their directions, and learn their business from the estate agents?—Yes. Woodmen, as a rule, have such a very contracted knowledge.

2098. It is for the education of owners and agents that you would suggest the State should provide additional facilities?—Yes, except for a few foresters on large estates—intelligent young men, often Scotchmen, but a few Englishmen—I do not know any race of woodmen who would benefit much either by lectures or books.

2099. Foresters on large estates would rank almost with agents?—Yes. On large Cheshire woods I have had a forester who was quite capable of being taught, and an intelligent fellow who would learn anything, but he was quite an exception.

2100. Are these head foresters ever attached to large land agents' offices so that they can supervise several small estates?—I think not. I think a forester is expected to do actual manual work, and he gets attached to one estate. He learns the habits of that estate, and the necessary treatment without being able to compare various systems.

2101. Would it not be possible to manage several small estates by one highly skilled forester?—I think it would be desirable that the estates should be of the same character.

2102. Do you find that the levying of tithe is any bar to plantations?—I do not think I do, but I find that the tithe is complained of after the plantations are planted very much.

2103. The tithe is often quite as heavy a tax, or even heavier, than the local rates, is it not?—It may be heavier; the tithe may be 5s., 6s., or more, and the local rates 3s. or 4s. But the two together mount up in twenty-five years very often to as much, at compound interest, as the total cost of the plantation. In other words, they double the cost of forming the plantation.

2104. Will there be any possibility of having the tithe remitted on the same principle as the local taxation?—That would be a new principle, and I do not see how it is to be done, but I think there is a very strong claim for remitting rates on land that is planted up to the time when it ought to be productive, because since the time of Elizabeth, as you know, there has been no rate except a highway rate charged upon such land until recently.

2105. But the tithe has been always charged?—Yes, and the highway rates have been always charged, but Elizabeth took off all the other rates in order to encourage the growth of woodland. Now we have the tendency on the part of the men who form assessment committees to charge 10s. an acre on all such lands; practically the same price that is paid for the adjoining agricultural land, whereas the woodland is generally a little worse, and it would cost from £8 to £12 an acre to bring it into the same agricultural condition as the adjoining land which is rated at the same amount. So that there is a gross unfairness in the incidence of the Poor Rate now.

2106. I judge from the very interesting tables that you put in that you look upon ash as one of the most profitable of the timbers?—That is so in my experience.

2107. Some of these returns show a very large profit?—In our best woods we can produce over £2 per acre per year for a long succession of years. In the woods on the Hughenden estates, Lord Beaconsfield's woods, which I have managed for twenty or thirty years, small woods, we have been able to produce an average of £2 a year on that 200 acres for a very long period. Lord Beaconsfield took a great interest in the matter personally.

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2108. That is a gross return?—The gross return.

2109. Have you any idea what the net return would work out at?—The net return varies according to the size of the wood, and the extent of the fences, and the system of upkeep, but I think you would find it cost to sell timber about 15 per cent., including the cost of felling the timber, and other expenses, and then there would be the regular cost of the woodmen. Probably about one-third of that would be the annual cost.

2110. Are you in favour of State forests?—I am not quite prepared to say I am. I do not see much advantage in England. I have seen many of the forests abroad, but I do not think in England we have much opportunity for State forests.

2111. Would you like to have a State experimental forest where the different methods of growing timber could be tested, and where foresters could be trained in Continental methods?—I should very much, but I am afraid our English land differs so much, not only in each county, but in parts of a county, that it would not be the same as in some of the German forests where they have large tracts of the same character of land.

2112. But, nevertheless, it would be desirable to test the soil and climate?—Yes.

2113. (*Mr. Stafford Howard.*) Can you tell me what is about the acreage of the beech woods in the Chiltern districts, taking High Wycombe as a centre?—I am afraid I can only give a general estimate; I should think 20,000 acres or more. I have charge of several thousands.

2114. I suppose High Wycombe is really the centre of the chair trade in this district, is it not?—Yes.

2115. And it is because of the chair trade at High Wycombe that these beech woods are able to show such a profit—or it is largely owing to that?—It was so; but that has been entirely altered.

2116. That is what I wanted to know, whether you have a market with the chair trade, or you have an outside market?—High Wycombe owes its chair trade to the fact that it was nearest to the raw article, the beech wood. But in the last 100 years, during which that chair trade has been growing up, the material has changed, and the proportion of home-grown wood used is now entirely altered. Instead of wholly using beech they do not use ten per cent. of home-grown material for all the chairs turned out at High Wycombe. Over £100,000 a year is brought to Wycombe Station in timber, and certainly not 20 per cent. of home-grown timber is used in the Wycombe chair trade from the whole of England.

2117. Where does the remainder that is produced in that neighbourhood find its market—does it go into any particular channel?—The quantity of timber I mentioned on 20,000 acres would be at once explained by about £20,000 a year.

2118. Then practically all the produce from the beech woods goes to High Wycombe?—Yes. I do not think our whole district would produce more than something like that per annum.

2119. You said just now that you thought the extent of land under beech wood might be very largely increased?—Yes.

2120. Would they find a market for it?—I think so.

2121. At High Wycombe?—Yes, and other places round about.

2122. The beech woods round the Chilterns are managed, are they not, especially in connection with the chair trade?—Yes.

2123. And the rotation is comparatively short because the size of the timber is not required to be very large?—There is a tendency to cut it too small, because there is a demand for small timber.

2124. I understood the rotation was about seventy years in some of the woods I went over—that ripe timber was about seventy years old?—That would be so no doubt. Beech timber we think arrives at maturity on an average soil in from fifty to eighty years; seventy years would be about the average.

2125. What do you think is the maximum cubic

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capacity that you would expect to get in these woods per acre?—We have decided that in all sorts of ways. I can tell you of a wood where we have had £200 worth per acre. The maximum capacity unfortunately consists of a few very large trees, but that is not desirable in the interests of succession. On a wood belonging to an estate at Beaconsfield, we measured a quantity on an acre, and found it worth over £200; but it was very bad wood, large timber close to the house, the largest I ever knew. That wood represented something like 2,000 cubic feet to the acre.

2126. Would that be the ordinary produce of an ordinary beech wood supplying the timber trade?—No, it would not. Ordinary timber in the best condition ought not to be worth more than from £60 to £100 an acre. That is the best condition the wood can be in, because it grows the timber more rapidly when it is in that condition.

2127. With regard to what you said about the rates, your object in relieving the landowner for so many years whilst the plantation is unproductive would be to encourage him to plant. Otherwise there is no particular reason in doing it, is there? You only suggest it for new plantations?—Yes.

2128. Once a wood is established, it goes on producing a regular income, so that the rate might be fixed and go on regularly?—I think so.

2129. But with a view to encouraging landowners to make new plantations you think the rate might be remitted?—Yes, to encourage them to make the heavy sacrifice of planting.

2130. You would relieve them for a certain number of years?—Yes, because I think it is an unfair burden at present, having regard to the conditions and the returns from the plantations.

2131. Do you think the existing woods are unfairly rated, considering the produce you have told us is got from them?—We are not allowed to consider the produce in rating.

2132. I was only asking you, considering what you get from them, do you think that the present large value which the rating authority puts upon them is too high?—It is not too high if you consider it as produce, but if you take it in its natural unimproved value—in the words of the Act—I think the rate on woodland is more than the Act intended.

2133. In comparison with the agricultural land is it more unfair?—I think so, distinctly. The farmers' sympathy is to keep the agricultural land low, and they think woodlands can bear a high rate.

2134. Perhaps you think it would be fair when relief was given sometime ago to agricultural land that it should have been extended to woodland?—I do.

2135. You think that as regards the beech wood on the Chiltern Hills the management is as good as can be desired for the particular purpose?—No. We have all kinds, good, bad, and indifferent, but I think there are many people there who know how to manage them if they would take the trouble. Too many of the owners do not employ a regular woodman; they shut the woods up and leave the ivy to strangle the trees, and the rubbish to kill the young stuff, and then they expect to find the crop ready for cutting.

2136. There are woods then where improvement might very well take place?—It might very well take place in three quarters of them.

2137. Is that because the owners do not take sufficient interest, or because they want to do it cheaply?—Because they want to do it cheaply, and therefore they neglect it.

2138. If it could be shown that they would gain more by being more careful, and spending more money on the maintenance, they would probably be more careful?—Tenants for life have their own views about annual costs.

2139. Have you any suggestions to make in which the matter might be improved, and they might be tempted to do better?—No, except the general one that I think any educational advantages would have their reaction in the improvement of the woods. It would be very slow, but it would be sure.

2140. You mean in generally calling attention to the question through such things as the report of a Committee like this?—Yes.

2141. And trying to encourage associations of landowners interested in forestry?—Yes. I think landowners neglect it, many of them, from want of attention.

2142. (*Professor Campbell.*) I think you are distinctly in favour of education for the landowner and the agent rather than the forester?—I think it would pay better.

2143. Do not you think that for some of these woods in England it would be desirable to appoint a good forester, and pay him a better salary, and relieve the agent to some extent of that duty? The agent too often has too much to look after?—Where the woods are of a sufficient extent, that is to say anything over 500 acres, for instance, they demand the services of a good superintendent forester.

2144. You have been to the Continent, I understand? Yes.

2145. And you have seen some of the woods as they are managed there?—I have seen woods in every quarter of the world, I think.

2146. I take it that your visits there have considerably stimulated your interest in forestry, and widened your knowledge of the subject?—Yes.

2147. Do not you think that head foresters ought also to go and see such woods?—Yes.

2148. Would it not be desirable to have such woods as you have seen on the Continent in this country where foresters could see them at their own doors?—I am afraid we could never get quite the same as the grand forest of Fontainebleau, and some of the large forests in Germany. We have not the places in England for them.

2149. You are afraid that in England we could not produce such forests as you have seen on the Continent, that you would not be able to produce forests good enough for an object-lesson?—There is something in that.

2150. Is that your idea?—I had not formed a clear idea on that, but I am a little afraid of it.

2151. I think you also expressed the view that the land in Germany was much more uniform?—There are larger tracts of the same character of land.

2152. And, therefore, we could never attain the same results in this country they can get in Germany?—We could not get quite the same object-lesson.

2153. Are there many small local industries associated with the plantations in your district? I have heard about the chair making, which interested me very much, but are there other industries?—There are the usual ones of wheelwrights, who use ash; builders, who use oak and other woods, and all the common trades.

2154. So that the presence of these woods gives rise to a considerable amount of labour and work for people?—Certainly.

2155. And helps to prevent depopulation?—Yes; it keeps men on the land in the winter.

2156. A great deal could be done in that way to prevent depopulation all over England?—A certain amount could be done.

2157. You think it would all tend in that direction?—Yes. I do not think it would be a very large amount, but a certain amount.

2158. (*Mr. J. H. Lewis.*) If people are kept on the land it would tend to a certain extent to improve the national health?—Certainly.

2159. You mentioned that you had seen forestry in different parts of the world. Can you confirm the statement that there is a smaller percentage of land under wood in the British Isles than in almost any other country in the world?—I have so read, and I have always observed so.

2160. Have you travelled in America?—I have been through the Californian forests and the Australian forests.

2161. From the observations you have made abroad, is it your impression that the timber supply of the world is diminishing?—I am afraid I could not say. Of course, I am always reading it. I have seen them cutting in Sweden to an enormous extent when I have travelled there, but it is impossible for anyone to answer your question without statistics.

2162. You mentioned that much land was denuded of timber in the middle of the last century; do you consider the fact that the British Navy is no longer built of timber is a factor in the discouragement of forestry in this country?—Distinctly so, as to oak, because oak is only worth a half now what it was when they used it for the Navy. It may be a coincidence, but it is a fact.

2163. (*Professor Schlich.*) I think I had the pleasure of meeting you some years ago at High Wycombe, when I came for the first time with the Coopers Hill students?—Yes, you were good enough to go round with us.

2164. You have given us for the Hughenden woods for the last twenty years an average annual income of £2 1s. 10d.?—That means the gross produce per acre.

2165. And you think the expenditure is estimated at one-third?—I think it is about one-third on the average of woods.

2166. That would leave really a net income per acre of 28s.?—No doubt.

2167. I have not been in Hughenden for some time now, but can you tell me from your own experience whether the stock in these woods is now smaller than it was 20 years ago?—I think it is just the same.

2168. That is the impression which I carried away when I was there about thirteen or fourteen years ago?—It has been cut very heavily during the last three years, but even allowing for that I think it is about the same.

2169. In other words, you think that woods treated like the Hughenden woods are capable of yielding, under present conditions, an annual net income of 28s. an acre?—Yes, and that will gradually increase if prices maintain their general rise.

2170. Some little while ago I gave some figures similar to those, and I was not believed; but here we have the thing on your own statement. You give altogether the returns of six woods; I have added them together, and I find the average returns of the six woods is £1 16s.?—I should take 12s. off that for the fair costs of every kind, and that will be 24s. net. I have taken specimen woods, without picking them out, and I thought you would like all the details, because they verify my statement.

2171. I have just taken the six woods, one of which gives as much as £3 2s. 10d., and one as low as 13s. 7d. Those six woods are under your management, are not they?—Yes.

2172. Are they all beech?—Unless others are mentioned they are entirely beech wood.

2173. Now these beech woods are all grown according to what is known as the natural system of regeneration?—Yes.

2174. And you go there at certain times and take out a certain proportion?—Yes. Sometimes six years and sometimes ten years.

2175. You put the wood into proper order, and you have practically no planting, or at least very little?—None at all in a good managed beech wood.

2176. They go on year after year, and they yield a net income on the Hughenden estate of 28s. per annum per acre?—Yes.

2177. (*Mr. Stafford Howard.*) I do not understand this third column in the tabulated statement. What is the meaning of "average price"?—I should think it ought to be the average price per load. It is per load of 25 feet. The local load is 25 feet, and it ought to be so stated.

2178. 25 cubic feet to the load?—Yes, it is very important to distinguish the 25, as it is the local load, and it makes the price double what you might suppose.

2179. (*Professor Schlich.*) You told me long ago, but I should like to get it from you now, that land on the Hughenden estate, supposing it was used for agricultural purposes, would be worth a certain sum?—Certainly not 10s. an acre.

2180. You told me 10s. an acre at the outside 13 years ago?—It is about the same now. It occupies the worst land on the estate for agriculture, the steep hill sides, and has other disadvantages, cold and exposure. May I, however, add that before you could get 10s. an acre you would have to spend £10 on every acre in grubbing, destroying rubbish, and other things, in preparing it for the plough?

2181. I would not compare it in that way, as there is wood on it now; but supposing there was other land with no wood on it, and the question was as to whether it should be used for agricultural purposes or put under wood, what would the price be then?—10s. would be the right price then.

2182. You are actually following a system in these beech woods which has been much discussed, and is known as one of the Continental systems?—Yes.

2183. Of course, people in other parts of England or Scotland might go to the Chiltern Hills and learn a great deal there?—I think so.

2184. They need not in the first place go as far as Germany and France. It is possible they might see there instances where things are still further perfect. But there are some instructive instances in this country where you could see a well managed wood?—Certainly I think so. I think we can find a few, not very big, some in the New Forest, and some of our beech woods.

2185. When I was in High Wycombe there was quite close to the place a wood which was not an example of good management. There was not a beech tree in it more than 20 or 30 years old; you know the wood I mean?—I cannot remember it, but I can find worse instances.

2186. You do not spend much on fencing these beech woods?—Very little indeed.

2187. Nothing on rabbit fencing?—After once starting the woods we do not spend anything upon them, because we keep up the live fences. Our cost in keeping down rabbits is simply what it costs to kill them. We do not allow them.

2188. Under the system of natural regeneration by the seed which falls from the old trees, you need not fence them against rabbits. I think you keep out cattle?—Yes, sheep and cattle. Pigs are supposed to do a great deal of good in a beech wood. They plough up the ground and help to bury the mast, but we never let them in on purpose unless we have a case of very bad open wood.

2189. (*Mr. Stafford Howard.*) But you kill down the rabbits?—The rabbits must be killed. Young beech and rabbits cannot live together. I have known a wood put back ten years in growth by the incursion of rabbits. They will eat every young beech at ten years old, when it is only really a walking-stick.

2190. (*Dr. Schlich.*) I want to bring out once more a point upon which you have already been kind enough to give us evidence. Any extensive means of education in forestry you said was principally of importance to the proprietor and the estate agent?—I think they are most susceptible to useful knowledge.

2191. There are some gentlemen now like yourself who have by experience in the course of time acquired the necessary knowledge, but supposing there were means given by which the general run of estate agents and proprietors could easily acquire some sound knowledge of how forests ought to be managed, then you think it would be quite sufficient if the woodmen working under them were practically trained in the woods themselves; that is your view, I understand?—I think so.

2192. You do not think it is necessary to have special forest schools for the forester?—I see great difficulty in training foresters. First of all, the difficulty is that the old men are not capable of being taught; if you tell them what to do they will do it. Young men take up forestry, and leave it for something which pays them a little more. It is extremely difficult to keep a class of young foresters.

2193. If these additional means for forestry education were given, you think it is more important at the present moment to provide such means for the agent who will have had a higher education, like the proprietors—a very good class of estate agents—and that that would be more pressing than the education of the foresters?—Yes, I think that is the only way to touch the matter, and the cheapest and quickest way. The only way is to get hold of all the agents and bailiffs, intelligent bailiffs, a little below the rank of ordinary agents, and they would be teachable men. Those are the people whom teaching would pay best.

2194. (*Colonel Bailey.*) In answer to Professor Campbell's question as to whether it would not be desirable to bring before the British people interested in woods some woods grown on the Continental system, so that they might see them here instead of travelling to the Continent to look at them, I understood you to say that the objection would be that there was no land available. But that would not apply, I suppose, to the case of such comparatively small areas as might be attached to a forest school for the purpose of practical instruction?—I think that would be very desirable.

2195. You did not refer to that?—No, I think that would be highly desirable.

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2196. You said, I think, that another objection to the growth of such model woods or demonstration woods would be that the ground was so very variable here as compared with the German ground; but, even supposing that was so, would not that fact rather help us than otherwise, because we should get many varieties of ground on a small area?—I think then you would need a number of these model stations on different classes of ground, and that would overcome my objection.

2197. Supposing the ground to be very variable, this would rather facilitate showing a number of things on a small area. Supposing you had an area of 5,000 acres and had five different classes of ground, you would be better able to demonstrate than if the 5,000 acres were all of one kind?—If you have 5,000 acres I think you would have 50 classes of ground in any part of England.

2198. (*Sir John Rolleston.*) I think you have practised in many counties in England?—Yes, a great many.

2199. In your experience is there too much cutting and too little planting by owners?—Yes. From my personal observation I should say that the woods of England are being cut for profit and being reduced in cubic contents. Planting is not carried on sufficiently. There is a tendency for landowners to overcut their woods.

2200. With the result that the stock of home-grown timber is decreasing?—Yes.

2201. And at the same time there is an increasing use for it?—Yes.

2202. Is a well-planted estate worth more in the market than an estate that has been denuded, apart from the commercial value of the timber itself?—Yes. I think all purchasers of estates are very particular to have ample timber. They like ornamental timber, and they also like to have timber of productive value.

2203. It is a bad policy for the landowner to denude his estate of timber and not to produce it?—A very bad policy, both from the market point of view and climatic point of view.

2204. Why do you think they are so reluctant to replace the timber that they cut down?—One of the reasons, I believe, is the bad times landowners have been suffering from. Every landowner wants to make a large revenue, and has had less capital to expend in the last 20 or 30 years.

2205. Then anything that would encourage the replanting of trees would be of national importance?—It would be very useful to the estate and of national importance.

2206. You said that the beech used at High Wycombe in making chairs was only 10 per cent. of the total used in making chairs. What is the other 90 per cent.?—The bulk of the wood is what is called Canadian and American birch. It is very much like beech in fibre. It comes into Wycombe in planks of convenient sizes at less cost than people pay for the actual home-grown beech, about 1s. or 1s. 3d. a foot. Other kinds of wood are used. A recent trade has sprung up there by which £500 or £1,000 worth a week of chair parts are being sent over, ready to make into chairs, from Canada. Some has been sent also from Stockholm and Sweden. Two firms have started in the district to sell the parts which are sent over for conversion into chairs. The trade is becoming a gigantic size. It amounted to £500 a week two or three years ago, and now it is over £1,000 a week.

2207. (*Mr. Stafford Howard.*) Has it affected the price of your beech?—I have not noticed that it has. I have given you a list of the prices at public auction. Were it not for this large competition and good trade we should expect the home-grown beech to go down rapidly in value.

2208. (*Professor Schlich.*) You also do a great deal in mahogany and rosewood?—The cubic quantity would not be very large, but enormous prices are paid in Liverpool for those. They mostly come through Liverpool. Mahogany, satinwood, and all the fine woods that make up the chairs that go to such places as Maple's, Shoolbred's and some of the large houses come from the woods abroad through various ports.

2209. (*Sir John Rolleston.*) Was the chair trade in Wycombe started because the beech-wood was there?—Yes.

2210. And now 10 per cent. only of home-grown timber is used?—Yes. I am Chairman of the Chamber of Commerce at Wycombe, and we get all the information we can, and that is the information we have got.

2211. (*Chairman.*) Do you think the forestry training that would be suitable for owners and agents could be best given at the Universities of Oxford and Cambridge in connection with some practical experimental forest area?—No. I think you must bring the teaching closer home to the existing men at a cheaper rate.

2212. I do not mean for the woodmen, but for the owners and agents?—That would not benefit men like bailiffs, who would not be able to go through a university career. I think the County Council technical classes and lectures would do a good deal.

2213. And the Forest School?—The Forest School for those able to pass through the course would be very valuable.

2214. You say you think there are a great many thousands of acres to be profitably reafforested, but do you think that the resources of the private owners will not be alone able to effect reafforestation on any considerable scale?—I do not think they would. I think if they were given a little encouragement it would just make many men plant. On behalf of the owner, a man who was very hard pressed in our district, we planted about 200 acres on the estate, and he has been always regretting that he locked up his money and complaining of the loss, and has not planted an acre since. I am concerned for half-a-dozen owners, and when I suggest planting they say "When shall I get any return?" I explain to them, and they say "Is it reasonable? I shall have to pay rates for 30 years, and when I am gone, or getting very old, the return will come in when it is no use to me."

2215. Do you find that the woods give more employment than the same land put to other uses would do?—We used to reckon 100 acres of arable land properly worked required three men. One hundred acres of grass is generally done with one man, and I do not know any woods which take more than one man to 100 acres. I would not break up any pasture land: as a rule there is no pasture land in the district I know that is not too good a pasture to break up into plantations.

2216. It is pure arable land?—Yes, pure arable land. Where it will grow good grass I should hesitate very much to break it up for plantations.

2217. If I might ask for an opinion on a matter which goes outside your district—we have evidence that there are about 16,000,000 acres of waste land and rough pasture in the United Kingdom, and that a large proportion of this could be profitably afforested. If that were proved to be true by an expert Commission, would you in that case object to the principle of the State afforesting such land gradually?—Not at all. I do not think there is any such thing as competition in wood lands.

2218. We import an enormous quantity of wood every year, and you think as far as possible it would be better to grow it ourselves?—There is too much imported to make any landowner rivals as to price. The quantities imported are so enormous that it would not touch the price.

2219. If it be done by the State you would have no objection to the principle of the State trying to make a large proportion of these waste lands productive?—As far as my evidence is of value in that matter I can see nothing against it. If £10,000 worth of timber is thrown upon the market one week it does not appear to affect the value of the timber at all. The proportion sent from abroad is so great that it is really only a matter of choice and convenience whether people buy home-grown or foreign. I do not think the State, if it afforested a large proportion of the waste, would be unfairly competing with any private owner.

2220. Do you think at the same time it might give employment to a considerable number of people?—Yes.

2221. (*Mr. Stafford Howard.*) It would not give more employment if you substitute wood for arable land—quite the reverse?—I understood waste land. If it is waste there is very little labour on it.

2222. But the land which you think might be planted with advantage in your district is arable land, is it not, not waste?—Most of it would be arable land practically left to run riot and wild.

2223. Is there much of that?—Yes, there is plenty of that; but where it is used and cultivated it is generally put down in grass or sainfoin and left 10 or 12 years.

2224. Is there any of that kind of land in the market?—Certainly.

2225. Large areas?—200 or 300 acres. I am very much wanting to sell a tract now of that description.

2226. (*Dr. Somerville.*) What is the price you are asking for it?—£10 or £12 an acre, with a very good shooting district close to a grand estate.

2227. (*Professor Schlich.*) This enormous development of the chair factories is simply due to the fact that these beech forests existed there?—Certainly.

2228. So that if forests were created in other parts of the country it is just as likely as not that a similar industry will be developed, because the forests will be there? The chair industry was developed in that particular locality because the woods were there?—I think so. That was the case with the chair trade.

2229. We might expect similar industries in out-of-the-way places if there were forests? It is more than probable that industries would develop in other localities in accordance with the nature of the timber?—I think so, providing that foreign competition, which smothers nearly everything, did not prevail.

2230. But apart from foreign competition?—It is difficult to put that on one side. There are some grand beech forests in the Alps, and yet they have never developed any industry there except charcoal burning. One sees the finest beech there, almost like the parks in France, and they have only developed charcoal burning and a little carving.

2231. Until quite comparatively recent times those woods were all used for fire wood?—Yes.

2232. (*Dr. Somerville.*) How often do the seed years recur?—I am not quite prepared to say, but with the beech trees we keep up we have always planted every year.

2233. Do you have masts every year?—Yes, but in some years more than another. We have a full mast year every third or fourth year.

2234. The seed drops on the surface of the ground and you do not require to take any special precautions for having it buried?—Not at all.

2235. You do not require to have the surface prepared for the reception of the seeds?—We never touch the surface. The rain and storms break the ground into a proper surface for the reception of the seed.

2236. When the beech wood is cleared off entirely the ground is left in very fair condition, is it not, for any other purpose?—It is very rare to clear a wood off entirely except where it is cleared for corn growing, but where it is clear it is full of vegetable matter, which has to be removed or counter-balanced.

2237. You say that larch grows well in that district also?—Yes.

2238. On the same kind of soil?—Yes, in light dry soil.

2239. On limestone?—Yes, chalk.

2240. I remember before the old Committee it was placed on record that the larch could not grow in Ireland because it was chiefly limestone. Now according to my experience larch grows exceedingly well on chalk or limestone. Is that your experience as well?—I do not know much about limestone.

2241. On chalk?—Chalk admirably.

2242. We had it in evidence the other day that quick-grown beech, that is to say, broad-ringed beech, sold at a higher price than slow-grown, narrow-ringed beech, but I suppose in the Chilterns the slow-grown narrow-ringed beech receives the better price?—No, I should say the quick-grown wide-ringed beech would sell a little better. The other is the hedgerow timber, which is very hard to work. It is a question of the attractiveness of easy labour compared with rough labour.

2243. In these very close beech woods of yours, where I suppose there is a complete canopy, trees grow slowly?—Our rule is to never have a complete canopy. You cannot grow young beech unless you have sun and air above them.

2244. That does not encourage weeds to spring up on the ground and choke up the young beeches?—Not to a large extent.

2245. You say that 100 acres of wood will maintain one man and his family?—I think every 100 acres ought to have a woodman.

2246. That is about what is usually accepted. I suppose that would be the case where the felling was done by the purchaser?—No, we employ a gang of men for that.

2247. The gang of men would be over and above?—Yes. Over and above the men looking after it all the year, there would be a dozen men in the winter every fifth, sixth, or seventh year.

2248. If the State were going to undertake the felling and planting, 100 acres would maintain more than one family?—Yes, but the others would be there only three or four months in the winter, and they would only go into the same wood, say every seven years.

2249. The working up of this timber in the manufacture of chairs in the neighbourhood must maintain another large increase?—Yes, a very large number.

2250. And I suppose the beech wood output may run to 50 or 60 feet per acre per annum?—Yes.

2251. Do you happen to know how much labour is required in the factory to work up 50 or 60 feet of beech?—That it is impossible for me to tell you. An imitation Chippendale chair might take a man a few weeks to do a cubic foot, whereas he could do several feet in a day with ordinary chairs.

2252. Do you say that the output of beech timber is 2,000 cubic feet?—Not the output, but the quantity upon the soil. 2,000 feet on an acre, worth 2s. a foot, would be £200, and that is the highest quantity I ever knew. That was contained in a very few trees, and all that was left had become giants to the exclusion of everything else, which was very wasteful.

2253. These trees were older than the usual run of trees, I suppose?—We reckoned the trees were 150 or 160 years old. They had had plenty of space, so that they lived longer, but there were very few of them on each acre.

2254. We had a forester before us yesterday who is regarded as one of the leading foresters in England, and he says that he and one of his friends once measured a wood in Germany, and found it contained over 9,000 cubic feet of timber per acre. I suppose such a figure is quite beyond this country?—I may say that I once saw one tree on an acre, and on measuring it found that the one tree contained 50,000 cubic feet, but that is the celebrated tree in California. At 1s. a foot it would be worth a very large sum.

2255. Is there any artificial sowing in your woods?—It is not the practice in the beech districts ever to plant young beech.

2256. Or to sow it artificially?—Yes. It is sometimes sown artificially, but not to any extent.

FOURTH DAY.

Friday, 25th April, 1902.

PRESENT:

Mr. MUNRO-FERGUSON, M.P. (*Chairman*).

Sir JOHN F. L. ROLLESTON, M.P.
Mr. EDWARD STAFFORD HOWARD, C.B.
Professor W. SCHLICH, C.I.E., F.R.S.
Colonel FREDERICK BAILEY, R.E.
Professor JOHN R. CAMPBELL, B.SC.
Mr. JOHN HERBERT LEWIS, M.P.
Mr. GEORGE MARSHALL.
Dr. WILLIAM SOMERVILLE.

Mr. REGINALD H. HOOKER, *Secretary*.

Professor W. Schlich, C.I.E., F.R.S.

25 Apr. 1902

Professor W. SCHLICH, C.I.E., F.R.S., a Member of the Committee; Examined.

2257. (*Chairman.*) It is hardly necessary, Dr. Schlich, to ask you for the information of those who are present the extent of your acquaintance with forestry, but perhaps I should do so for the sake of the evidence. You have had a long experience in forestry in all its branches?—I have been engaged in forestry since 1859, which makes 43 years. I studied the theory for three years to begin with and practical forestry for four years, and entered the Government service, in the higher branch, of Hesse Darmstadt. Then I accepted an appointment with the Government of India, held various appointments in different parts of the country, and for the last four years I was Inspector-General to the Government of India. In that capacity I visited most parts of India, with the exception of Madras and a portion of Bombay. I was sent on deputation to England to establish a forest school for the Government of India at Coopers Hill in 1885, and on the 1st of January, 1889, I accepted the post of principal Professor of Forestry at Coopers Hill, a position which I have held ever since. I have visited since then most parts of Germany in which forests are situated, considerable portions of France, parts of Austria and Belgium, many places in Ireland, and also the Highlands of Scotland, and various parts of England.

2258. You have formed very definite opinions, as we know from your writings, with regard to the timber supply of the world. Could you give us any information with respect to the resources of the British Empire and Britain itself in particular?—With regard to the British Empire, of course my information is based on the supply of the world generally. I have handed in an extract from a paper (*Appendix II.*) which I read at the Society of Arts a little more than a year ago, in which all the detailed figures referring to this question are contained. First of all, I may mention just quite shortly that the deficiency of the imports and exports in Europe generally amounts to about 2,600,000 tons every year. Of that I have traced to the countries from whence it comes 2,300,000 tons. The remaining 300,000 tons I have not succeeded in tracing. With regard to the British Empire itself, I have shown from official records that during the period 1895 to 1899 there was a net import into the British Empire of timber worth £17,850,000 annually, while the annual net imports for 1890-4 were £13,994,000, or an increase over the former period of £3,856,000, or an annual average increase of £771,000. The average annual increase in the previous five years, 1885-1889, compared with the period 1890-4, was only £382,000, so that in the last five years the net annual increase had exactly doubled. I must next mention that the principal imports into the United Kingdom of Great Britain and Ireland amounted to £17,595,000 in 1890-4, and that had risen in 1895-9 to over £22,000,000. The extraordinary fact which I want to bring before the Committee is the large number of British possessions which import timber. The countries importing timber are Great Britain and Ireland, New South Wales, Victoria, South Australia, Ceylon, Mauritius, Natal, the Cape of Good Hope, Jamaica, Barbadoes, Trinidad, and British Guiana. The exporting countries are Queensland, Tasmania, Western Australia, New Zealand, British India, the West Coast of Africa, British Honduras, and the Dominion of Canada. Out of the total export of these countries, the Dominion of Canada is answerable for no less than £4,835,000, and the rest altogether for only about £1 000,000 worth. I do not know whether I have properly answered your question.

2259. I think the only thing that I can ask as a supplementary question would be whether you think that rate of increase in the timber to which you allude is likely to continue as far as British imports are concerned?—These imports always go in certain waves. When there is a great development in industry generally the increase is great, and if there is a depression in trade the imports generally sink again. But I wish to point out that as far as England is concerned, although there are ups and downs, there is a steady increase. I shall give you the exact figures with regard to Great Britain and Ireland. In 1864 the imports amounted to 3,396,000 tons in round figures. The next figure from 1864-8 is 3,528,000 tons annually; in 1869 to 1873, 4,459,000 tons; and in the next period, 1874-8, 5,844,000 tons. Then there comes a slight relapse in 1879 to 1883, when the imports amounted to 5,789,000 tons. Then in 1890-4 there is a further rise to 7,628,000 tons; in 1895-9 it was 9,290,000 tons; and in 1899, only one year, the amount was 10,008,000 tons. Therefore you will see there has been a steady progress. I should like now to give you the figures for Germany as bearing on the subject. The figures are for practically the same period. During the years 1842-1864 the imports and exports of Germany nearly balanced. In the whole of those 22 years there is an average annual import of 13,000 tons—practically nothing. In 1865, which is the commencement of the period for which I have given the British figures, the imports jumped up to 913,000 tons—net imports. Then I will go on to give it you for every five years. In 1870-1874 the mean annual net imports were 1,992,000 tons, after that come the years when the great collapse in German industry occurred, some years after the French War; in 1880-4 it was 1,186,000 tons, a considerable drop; then a rise came again in 1885-9, 2,075,000 tons; in 1890-4, 2,796,000 tons; in 1895-9, 3,200,000 tons; and in 1899, the one year only, 4,600,000 tons, about half that of Great Britain and Ireland. That is of special importance with regard to our timber supply, because you will observe that Germany will be a great competitor with England in the Baltic. I may mention that of the timber which Germany has imported latterly, about 1.883,000 tons came from Austria-Hungary, and 1,831,000 tons from Russia, while comparatively smaller quantities came from Sweden and Norway, 570,000 tons, and North America, 262,000 tons. The difficulty is that Austria-Hungary, I have every reason to believe, will not be able to continue, beyond a limited number of years, to export at the rate which it has done lately. It has been stated officially that the stock in the Hungarian State forests is something like 30 per cent. below the normal amount, and it has been decided to reduce the output of the Hungarian forests so as gradually to bring the forests again up to their normal condition. With regard to the rise in Austria proper, data do not enable me to draw a conclusion with the same certainty, but still I think I have enough information at my disposal to say that, even from Austria proper, the exports cannot last beyond a certain number of years. I have shown that in this way:—The average consumption of timber in Great Britain and Ireland amounts to about 14 cubic feet per head of population; in Germany it amounts to 18 cubic feet per head of population. The

whole production of the Austrian forests is only 19 cubic feet per head of population. Considering that the growing stock in a large portion of the country is already below par, it stands to reason that when industries have been developed in Austria to something approaching their state in Germany, and they are developing rapidly, Austria-Hungary will probably require, after a certain number of years, the whole of its timber supply. Assuming this to be correct, Germany must go somewhere else for its timber. It has already drawn nearly half its supply from Russia, and of the rest some 570,000 tons from Sweden and Norway, and it will have to fall back more and more on the Baltic, or, if possible, North America. I wish here to give some information which I have only gathered during the last fortnight. I went to see the head of the Prussian Forest Department, and he informed me that according to the inquiries which he has lately set on foot, he has come to the conclusion that in the Russian Empire, which is really the crux of the whole business in this case, only 25 per cent. of the country has more forests than are required for home consumption. About 25 per cent. of the country has just about what it requires, and 50 per cent. of the Russian Empire has less forests practically than are required for home consumption. He, moreover, informed me that from inquiries made of the large timber merchants who go to Russia to buy up forests and export the timber to Germany, he has ascertained that a reverse current has set in; that they now sell a considerable portion of the timber which they cut to be transported into the interior of Russia, because they can already get better prices there than they get by exporting to Germany. I consider that a very important statement, especially as it comes from the head of the Prussian Department.

2260. It is sometimes assumed that timber is continuously being displaced in certain industries by the use of metal and other substances. On the other hand, there must be, from the figures which you have given, a sufficient number of sources of new demand to maintain the need for imports?—I have compared the increase in the population of Great Britain and Ireland for twenty years, and I find that during those twenty years the increase in population is exactly 20 per cent. The percentage of increase in the imports of timber during the same twenty years was 45 per cent. In other words, now every inhabitant of this island consumes more timber than every inhabitant did twenty years ago.

2261. Having dealt with the question of imports, will you give us your views regarding the afforestation of surplus areas in Britain?—May I say just two words about North America?

2262. Certainly; that would be most interesting?—Of the total imports into Great Britain and Ireland, conifers comprise 87 per cent. of the tonnage, and only 13 per cent. are other woods. The only sources of a large supply of conifers are the countries round the Baltic and North America. A moderate amount comes from Tasmania, but it is not worth mentioning; it is such a limited number of tons that it does not count. There are also believed to be extensive forests in the back part of the Argentine Republic, but it appears that for a long time to come the difficulty of getting it out is so great that the Argentine Republic at present imports its timber. It is also believed that there are certain extensive forests in the western part of China round about the headwaters of the big rivers; but, on the other hand, it may be said that as soon as the trade and industries of China have developed, China will find it absolutely impossible to supply itself with timber, and will have to call largely on Western North America, and possibly on Asiatic Siberia. So that practically, as far as we are concerned, the two great centres of supply are the Baltic and North America. With regard to the Baltic I have given you some data. As regards North America I wish, first of all, to point out to you that it has been proved by an American authority that there is a deficit. For instance, it has been proved of late years that, even making a liberal allowance for the annual increment in the forests in the United States, they have consumed about 33 per cent. more timber than the annual growth, although there is still a considerable net export from America, amounting, I believe, to 1,000,000 tons. On the other hand, a very large proportion of timber is already imported into the United States from Canada. Looking at the returns of Canada, we find that during the years 1870-1879, 58 per cent. of the exports went to Britain and 33 per cent. to the United States. During the ten years 1880 to 1889 the export to Britain had fallen to 49 per cent., while those to the United States had risen to 42 per cent. During 1890-1899 the percentage of exports to Britain had further fallen to 48 per cent., and those to the United States had risen to 46 per cent., so that practically the United States get already as much timber from Canada as does Great Britain. With regard to the United States, the value of the average annual total exports amounts to £6,043,000, and out of that they reimport from Canada £3,490,000, leaving a real net export of only about £2,553,000. As regards Canada itself, the extraordinary fact is that the exports during the last 30 years have been practically stationary. I can only give you the value of the exports. In 1870 to 1879 the average annual exports were £4,536,000; in 1880 to 1889, £4,477,000; and in 1890 to 1899, £5,247,000, a slight increase in value, but at the same time, as it has been proved that the price per ton during the last ten years has been somewhat higher than it was before, it is probable that even a little less was exported during the years 1890 to 1899 than in the previous two periods of ten years. Therefore you may say practically that the export from Canada has been stationary. I may add that if Canada were to decide at once to introduce systematic management of her forests by selecting, say, 10 per cent. of her forests, converting them into permanent State forests—and they all belong to the State at present—managing them on rational principles, Canada could probably supply the whole world with coniferous timber, as the acreage is so large. They have something like 800,000,000 acres of forest land, of which about 266,000,000 acres may be classed as timber forests. They have only to select from 10 to 15 per cent. of their area, and putting that at once under systematic management, letting the timber dealer have the run of the other 85 per cent., according to the present conditions, and they could probably, at a time when the rest of the forests were exhausted, secure from the reserved State forests a sufficient supply of coniferous timber for the greater part of the world. But Canada is independent. Still, the suggestion might be made.

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2263. Do you think there is likely to be a shortage unless all the Canadian forests are put in order?—Yes. Canada is the key to the whole business, because there we have a great stock of coniferous timber, which is what I call, amongst timber, the "staff of life." With regard to hard woods, I do not think we need trouble ourselves at present, because there are large stocks, and if one particular kind of hard wood should give out, others could be made available. There are very large stocks of hard wood in South America and in Australia. Therefore any shortage of the harder, heavier woods might be made good from other sources. But there are no other sources to any extent worth mentioning, except those two great centres round the Baltic and North America, for coniferous timber, and the United States will require every stick they can produce, and probably more, unless they persist in the measures which they have taken of late for establishing forest education and declaring reserve State areas where it is still possible. I do not know whether the Committee is aware that there are forest faculties at three of the principal American universities, and instruction is given at about 40 other educational establishments, conveying a more simple instruction in forestry. In the three colleges there is, I think, a degree in forestry.

2264. Before the Canadian forests could be put into proper order you think there is a possibility of a timber famine?—They have in Canada a forest revenue of very nearly £1,000,000 now. If they were to devote half of that sum for a few years to the establishment of these State forests, and bring them under proper management, it would not mean that those reserves were actually shut up. Over and above the material taken out of the open forests, the reserved forests would yield at once a certain quantity of timber and after a certain number of years, they would be gradually able to make up any falling off which might occur in the outside areas. I should say that in the course of 30 or 40 years they might be probably brought up to full bearing, yielding thereafter enormous quantities of timber and other forest produce, and a revenue many times that which the forests now give.

2265. Do you think that the price of wood is likely to rise within the next 30 or 40 years?—I have gone into that question so far that I have acquainted myself

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with the average value of all the imports into Great Britain and Ireland during the last five years. I may mention that I have generally examined the question for a good many years back, and I find that, beginning about the year 1870, or a year or two afterwards, owing to the development of means of transport, the price of timber gradually fell and continued falling up to the period of 1886 or 1888. At that period it began to get stationary, and remained so for about six years, but there began an appreciable rise in about 1894. I have calculated that from the middle of the period 1890-4 to the middle of the period 1895-99, as regards Great Britain and Ireland, the mean annual increase of imports in tons amounted to 4·4 per cent., whereas the increase in the value was 5·2 per cent. In other words, the value has risen more rapidly than the tonnage. From these data I have calculated that this represents an actual increase of 18 per cent. in the price of imported timber. I have also taken the coniferous timber by itself, which amounts to 87 per cent. of the tonnage, I have calculated the average price for the years 1895, 1896, 1897, 1898, 1899, and I find that it was as follows: In 1895, £1 17s. 7d.; 1896, £1 19s. 10d.; 1897, £2 2s. 2d.; 1898, £2 2s. 7d.; and 1899, £2 3s. 2d., which represents, on coniferous timber by itself, an increase of 15 per cent. in five years.

2266. Have you any further points in connection with imports to lay before the Committee?—I do not think so. Full details are given in the paper, which I have handed in.

2266*. (*Professor Campbell.*) The paper you read at the Society of Arts, I understand, will be printed in the evidence?—Yes, in a somewhat reduced shape.

2267. With regard to the afforestation of surplus or waste areas in Great Britain, do you think there is a considerable field for operations open there?—My personal opinion is that there is a considerable field. At the same time, it must be always remembered that to afforest land leads to a certain amount of inconvenience to the surrounding population. But I do not see why that should not be overcome. I do not advocate for a single moment the afforestation of areas now used for agricultural purposes, but I think there are sufficient surplus areas in this country which may be made available for afforestation, to such an extent that probably most of the temperate timber which we now import may be produced in this country. I have shown that, roughly speaking, there is an amount of land, which includes inland water, of something like 14,000,000 acres in this country which is not accounted for in the agricultural returns. It is waste land. Supposing we take a couple of millions off for inland water, roughly speaking there are something like 12,000,000 acres of land practically not accounted for. Some three or four years ago I examined the returns for all the counties around London within a circle of 50 miles, and I found there were 770,000 acres not accounted for.

2268. (*Mr. Marshall.*) How many counties were there?—It was within a radius of 50 miles from Charing Cross. I am sorry I did not bring the statement with me.

2269. (*Mr. Stafford Howard.*) Not accounted for in what way?—I could not find out what it was used for at all. I only mention that as an example. The areas of so-called surplus or actual waste lands in England are about 4,000,000 acres according to the returns, in Wales about 700,000, and in Scotland about 4,200,000 acres, or a total for Great Britain of about 9,000,000 acres. Ireland has about 5,000,000 acres of such land. But, besides that, there is what is called mountain and heath land used for grazing. That in the agricultural returns is entered at about 12½ million acres. It is quite impossible to say how much of that land might be available for afforestation or suitable for it. I think I must leave Ireland out, and say that there are in Great Britain about 9 millions actually waste lands and about 12½ millions of mountain and heath land used for grazing, or altogether about 21 millions. Of the mountain and heath land there are nearly 2 millions in England, about 1 million in Wales, and about 9 millions in Scotland. As I say, there are of course difficulties in the way of making land available, even land which is now used for so-called light grazing. If, however, the Corporation of Liverpool has succeeded in clearing the catchment area of their water, of all rights, etc., I do not see why, if it was considered necessary for the welfare of the State as a whole, it should not be possible to acquire other areas in a similar way, provided it is not done in a harsh way.

2270. (*Chairman.*) As there seems to be some uncertainty as to what proportion of this waste and heather area is available for proper afforestation, would you favour the appointment of a small Commission of experts to consider and report on the matter?—I consider that one of the most important steps to be taken. The small Commission of two or three should inquire county by county, or part of county by part of county, what areas could really be made available for prospective afforestation. Of course general statistics are all very well; but in the long run they do not prove much. Unless you make a minute inquiry from county to county you are always met by the reply: they may be there, but are they available? A small committee to make an inquiry county by county is the most important step that could be taken.

2271. What are your views as to the financial aspects of afforestation of surplus areas?—As regards the financial aspect, of course we are, as far as Great Britain is concerned, in a very peculiar position. Any data which we have with regard to returns suffer under two great drawbacks. First of all, by far the greater part of the areas under forest in this country have not in the past produced as much timber as they could produce if properly managed; and, secondly, the returns which are at our disposal are mostly a little haphazard. I think Mr. Drummond, who is coming here to-day, might be asked on that particular point, because he is the manager of large estates, and I think he will tell you that these returns are worth little or nothing to him, that they are never above suspicion, so that anything that may be based on the returns we have at present, with the exception of very few like those of Mr. Vernon's yesterday, should be always considered with some suspicion; first, because the areas have not been fully productive, and, secondly, because they are made up in a way which does not actually show what forests actually can do, as there are other accounts mixed up with them. I had, for instance, to go into the matter in connection with a forest of one of the largest proprietors in this country, and I found, as we heard yesterday, that a considerable part of the expenditure was due to the laying out and maintenance of grass rides, over which you can drive a carriage and pair. There are enormous amounts spent for fencing which are not chargeable to the forest, and so on. Of course I need not say anything more about that. The expense is quite justified from the point of view of the owners, because they want to realise certain objects, and the desire of the proprietor of the forest must govern the matter. I am a little loth to introduce data not referring to this country, but if you will allow me I shall give you a few data from a Continental country, the kingdom of Saxony, which in many respects, according to my idea, is the one to be studied by those who are interested in forestry in this country, because there is a high state of development of industry there, and the Saxon forests produce chiefly what we want in this country, enormous quantities of coniferous timber. I have brought a few data, and I shall be most happy to give minute data with regard to that matter afterwards if desired. A thoroughly systematic management commenced in the Saxony State Forests between the years 1811 and 1831, and reliable data begin to be available from the year 1817. The Saxony State Forests have slightly increased since then, from 354,000 acres to 412,000 acres, an increase of about 17 per cent. Now, taking the whole of the Saxony State Forests, the average quantity of timber taken out of these forests per acre annually, between the years 1817 and 1820, was 41 cubic feet. Between 1884 and 1893 it was 69 cubic feet. For not quite the same period, but between the years 1844, when we have the first complete measurement, and 1853, the stock of timber standing on the area of the Saxony forests averaged 2,128 cubic feet per acre.

2272. (*Dr. Somerville.*) Calliper measure? — Calliper measure.

2273. That is to say, if we convert these into English figures we must decrease them?—Yes, but that is not the point. The point is that I desire to show there has not been over-cutting. In 1844 the average per acre was 2,128 cubic feet; in 1893 it was 2,618 cubic feet, an increase from 2,100 to 2,600, while at the same time this large increase in the cutting took place. You see the point now, I think. With regard to the money returns, in the first ten years, 1817 to 1826, the total annual receipts were 7·3s. per acre, whilst the expenses were 3·3s. per acre, the net receipts thus being in 1817 exactly 4s. per acre per annum. In 1893 the total receipts were 28·07s., the expenses were

9·67s., and the net receipts for the whole of the State forests, good, bad, and indifferent—and there are a good many indifferent ones, as they go to 3,000ft. elevation—were 18·40s. per acre. I wish to say here that the increase in the net receipts was 361 per cent. Now you may say, What about the price of timber? In 1817 to 1826 the average price per cubic foot was 2·04 pence, in 1893 to 1894 the average price was 4·08 pence, representing an increase of 129 per cent. The net receipts have increased three times as fast as the rise in the price per cubic foot, due to improved management. May I supplement that by one particular range? I have selected one of the ranges which is by no means the best. Is is a district called the Antonsthal Range, an area of 4,072 acres, managed by a highly trained forester, situated in the Erzgebirge, between an elevation of 1,500ft. and 2,700ft. above the sea, being on slopes with eastern, western, and southern aspects, on granite, mica, schists, and eruptive rocks. The soil, except on southern aspects, is generally loam, but in the higher parts shallow and frequently covered with heather. Distinguishing between four quality classes of soil, and calling one the best and four the least, the average quality is 2·7. It is, therefore, between the second and third quality. The species grown there are 93 per cent. spruce, 3 per cent. silver fir, Scottish pine and beech, and 4 per cent. blanks, for certain reasons. The growing stock in this forest in 1839 averaged 2,100 cubic feet per acre, and in 1893 it was 3,276 cubic feet. The receipts per acre were 48·3s., and the expenses 10·3s., the net receipts being 38s. per acre per annum. These are forests situated, as I said, between 1,500ft. and 2,700ft. above the sea. You may say, That is all very well, but how does that apply to our conditions? We often hear it said that on the higher hills in this country timber cannot be grown successfully. Of course there is some difficulty at starting, but I maintain that in these high elevations these forests produce this large quantity of timber because they were always kept under forest, the productive powers of the soil were preserved, and they were taken under systematic management in 1817 before any large demand, except a local demand, had arisen on these areas. There is not the slightest doubt that the greater portion of Britain was once under forest in former times, but the forests have disappeared, and these areas have been long exposed to climatic influences, and the greater portion now is in a condition that on starting you have some difficulty; but if you succeed in raising the first forest crop again on those areas, there is not the slightest doubt the yielding capacity of the soil will return again.

2274. (*Chairman.*) Then, in order to carry out the necessary improvements in forestry as practised in this country, would you give us your views on the development of forestry education in Britain?—The question of forestry education is a little complicated in this country. We have, in the first place, with the exception of small areas, the whole of the land in private hands, and this necessitates our exercising a considerable influence upon those persons who can finally determine whether land is to be afforested or not, that is to say the proprietors. Then we have what I should call a high class of estate agents. Again, there is a demand for good managers for smaller estates, and a demand for the actual forester. I think we must approach the thing from this point of view. We ought to provide the means of high forestry education, and for a somewhat lower education. For high education I propose, and strongly recommend, a faculty of forestry, either by itself, or in connection with agriculture, to be established at, say Edinburgh—I only give that as an instance—and either Cambridge or Oxford. I must deviate a little here. I think we ought to approach this question of the higher education from an imperial point of view. We want highly trained experts not only for this country, but to send them to the Colonies and to India. We have a special establishment for India, but forest experts are always being demanded by the Colonies. The Indian Forest Department, whenever it is possible, readily agree to supply properly trained forest experts for forest organisation in the colonies; but still it is a heavy demand. It has now come to this, that the Indian Government has had to add a certain percentage to its staff in order to be able to always have a certain number on hand whom they can lend to the Colonies. That is all very well, and we have been most happy to do that in India, but it is a state of things that neither can continue, nor ought to continue. The imperial idea is now developed to such an extent in this country that I think we ought to attack this higher forest education from an Imperial point of view. I think we ought to have a Faculty of Forestry at the University, one in Scotland and one in England, where we can give a thoroughly complete training to forest experts, gentlemen who either like to work in this country or go to the Colonies or India. I will first take the proprietors. A large proportion of the landed proprietors go to the University to take their degree, and they should be given an opportunity of becoming acquainted with forestry. They might choose to take a degree in forestry, but it is not very likely, and it does not matter very much; but they should be given an opportunity of becoming acquainted with the principles of sylviculture and forest management by either attending portions of the general course or by a special series of lectures given to the sons of landed proprietors. Both might be very well arranged for; it would also apply to some extent to the higher class of estate agents, who would go in for the degree of forestry or agriculture, or the two combined, as the case might be. In one case agriculture might be the first subject and forestry the second, and in the other case forestry might have the first place and agriculture the second. Or even if they take an ordinary degree just to prepare themseves for estates management—and there are a good many of them nowadays—they should have an opportunity of becoming acquainted, by attending a somewhat higher course, with sound principles of forestry. For that purpose of course we require the means. In each case, both in Scotland and in England, there ought to be means found to acquire a forest estate of sufficient size to be used as a teaching forest for the schools. Until such can be done I have no doubt that preliminary arrangements might be made in some of the private estates which are thought to lend themselves to the purpose of instruction. Although a good many of these estates have not forests in such a position that they can for any length of time serve that purpose, still there are instructive patches of forest in almost every one of them. I have lately become acquainted with the forests of the Duke of Bedford, which are situated within one hour's rail of Cambridge or Oxford, where there are a good many patches of forest which could be used for instruction. Although as a whole they are not in the condition in which I should like to see them, His Grace has been good enough to ask me to make him a working plan, which I did about three years ago, and it is being gradually worked up to. A good portion of these forests can be used for practical instruction. The gentlemen who attend such lectures will also be in a position, by having the means, to go on excursions to the Continent until we have provided in this country the areas where this practical instruction can be given. As to the lower education, I will go at once to the lowest, and may then add a few remarks about the middle class. With regard to the instruction of the foresters who will take charge of the smaller areas, I am strongly of opinion that the best thing to be done is to effect this in the school forests, or instruction forests. Such an instruction forest should have a competent manager, and these men who desire to work themselves up to foresters on smaller estates would come as apprentices, would work in the forest, and receive just sufficient pay for their food and keep. The manager should be thoroughly competent to give all the practical instruction necessary, and also some elementary theoretical instruction, at any rate to guide them in reading elementary works on science connected with forestry. If you attempt anything more I think you will meet with great difficulties. Let the ordinary forester who manages small estates begin as a young apprentice, as a working man. He should have a fair school education, and then come as a youngster to be apprenticed in the school forest, and work for his living, and he would be instructed in practical work, and, as I say, the manager ought to be able to give some elementary instruction in science. I now come to the intermediate position. It may be possible to make provision at agricultural colleges, where the ordinary class of estate agents go, for a course of theoretical instruction consisting of a moderate number of lectures, accompanied by visits to school forests and suitable private estates—and I add, as an important point, distinguished apprentices trained under the lower course should be given facilities to attend such a course if they had made sufficient progress to warrant it. That is an outline of my scheme.

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2275 Probably Cambridge would be the best centre at which to give the owners some instruction?—Until Mr. Rhodes' will was published I should have said Cambridge, but now that probably so many Colonial students will be coming to Oxford I think we must not put Oxford on one side—we must consider it.

2276. But you would take one or the other?—Until Mr. Rhodes' will was published I should have said Cambridge.

2277. Supposing the Duke of Bedford were good enough to allow his area under plan to be utilised, that would be sufficient for practical demonstration purposes for Cambridge students?—Yes, to start with. On the other hand, let me point out that a good many of the woods in the Chiltern Hills are probably more easily accessible from Oxford. The Duke of Bedford's woods are only about a quarter of an hour further by rail from Oxford than they are from Cambridge.

2278. At any rate we have a definite proposition that one or other of the great English Universities would be a good centre for the instruction of the higher classes?—Yes. Probably the authorities, as the matter stands at Cambridge at present, would more readily meet any requests than Oxford; but what changes this influx of 164 scholars will make on the authorities at Oxford it is as yet impossible to say. I expect very considerable changes in Oxford.

2279. I think it very desirable to have definite views on these points which you have mentioned. Have you any views as to where the best site for the forest school or for the instruction of working foresters should be?—In the case of England I am afraid there would be a little difficulty, but I do not see why we should not enquire whether we could get an area which is at present under the management of His Majesty's Commissioners of Woods and Forests.

2280. What sized area do you think would be required? I might put it shortly: Do you agree generally with Colonel Bailey's scheme for an experimental forest area?—I agree with Colonel Bailey that it is absolutely necessary to have such a forest.

2281. And as to the size of it?—With regard to the size, of course the larger and the more varied the better. I have something else to say on that subject. I have to make another proposal, which I am a little afraid of bringing forward as the South African war is not yet finished, although I daresay it will be finished soon. I do not see why the State should not acquire certain estates in several parts of the country. Instead of having one area I should have several, and the State might consider whether it would not be worth while to acquire certain areas in various parts of the country, and every one of those might be made available for instruction.

2282. But as to the instruction for the owners, we had it quite clearly from you that Cambridge or Oxford would be a suitable centre?—Yes.

2283. Probably a beginning would be made at one centre first?—Yes; I should not advise two to start with, because it would be asking too much if you went in for more than one.

2284. What centre would you choose for the forest school or the working forest?—We are going to look at an area which Mr. Stafford Howard has drawn our attention to, and if that were found to be suitable it might possibly lead to this, that Oxford might be more suitable than Cambridge. If, on the other hand, we could get hold in some way or other of an area like Esher woods, or some others in the centre of England, under the direction of the Commissioner of Woods and Forests, possibly Cambridge might be as well suited. Whether we took Oxford or Cambridge would to some extent I think depend where we have our school forest.

2285. Then you would have your forest school for the training of foresters within reach either of Cambridge or Oxford?—I should have it so that the lecturer or professor in charge at either Oxford or Cambridge could readily go to the school forest and take his students readily there. With regard to the students at the University, the question of £ s. d. does not come in to the same extent as in the question of the lower students. Of course the nearer the better, so that you can get there in an afternoon, but I would not make that an absolute point. The railway communication is so good in England that a somewhat longer distance would not be very important. The great point is to get a suitable area.

2286. The first point then is to get a suitable area?—Yes, even if it is a little farther away from the Faculty of Forestry at the University.

2287. Supposing you find the most suitable area in the North of England or in Scotland, would you begin there?—I should begin in Scotland as one centre certainly; but I think we should make a great mistake if we are going to concentrate the business in Scotland.

2288. You would carry out the Imperial policy better in connection with one of the Universities with the Forest school within reach of it?—Yes; I should prefer one in England and one in Scotland.

2289. Perhaps you will give us some information about Coopers Hill and your views regarding its suitability for the education of Indian forest officers or colonial forest officers?—May I make a suggestion? Perhaps you would prefer to ask me a question about the course at Coopers Hill, so as to give an idea of what we consider a forest expert should know.

2290. I will put my question in that form, if you will kindly give us a sketch of the course at Coopers Hill?—At Coopers Hill we only pretend to train foresters for the service of the Government of India. In that country forest management was systematised in 1864. Since that time we have constituted something like 60 million acres of land as permanent State forests, and we have some 20 million acres of other forests to manage, for which we require a large staff. We have about 200 English officials, and about 11,000 native officials, so that you see it is a large concern. We have trained the officers of the Indian Forest Department since the year 1867, first in France and Germany, subsequently in France only, and since 1885 at Coopers Hill. The importance of the business you will at once perceive from this, that while in those 40 years the condition of the forests in India have enormously improved—in fact, in some parts so much that people say it is actually beginning to affect the climate—the net revenue of the Indian forests in that time has risen to something like six times what it was in 1864. Thirty-five years ago the net revenue was 16 lakhs, now it is about 100 lakhs. This, of course, is already a considerable item of State income, and the results have been so good that the Government of India is determined to give the best possible education to the superior forest staff. In 1885 I was deputed to establish the forest branch of Coopers Hill College. It is tacked on to an engineering establishment, and only a quarter of the students are forest students, and three-quarters engineering and telegraph students, so that the importance of the engineering training is greater than that of forestry. Every year a certain number of candidateships are advertised, and the competitors go up for an examination in mathematics up to and including trigonometry, botany, chemistry and heat, English composition, geography, geometrical drawing, free-hand drawing, and German. They can select also out of a number of subjects two further subjects. The following is a list of the subjects from which they may select:—Higher mathematics, Latin, French, Greek, elementary physics, physiography and geology; but they are not allowed to take more than two. They take up those I read first, and two of the others. In fact, they are the class of men we get from our higher public schools. Those who pass the examinations in the best manner, if there is otherwise no objection to them, are sent to Coopers Hill for three years' training. We continue geometrical drawing and freehand drawing, and we teach them surveying, a little forest engineering, a little about accounts, and continue to keep up their German, giving them a couple of lessons a week. They get some elementary physics, selected chapters of organic chemistry and analysis of soils, and they have geology, entomology, botany, and forestry. As the syllabus stands, every student at Coopers Hill receives 410 lectures on forestry, and about 150 lectures on botany, 30 lectures on entomology, and 45 on forest law. The botany is accompanied by excursions and by work in the laboratory. They have to work in the laboratory 60 times, and they have about 20 excursions into the field. The forest instruction in the class room is supplemented by excursions. Altogether, in the first year there are about 20 half day excursions, and five full day excursions, these excursions being generally to forests in the vicinity of Coopers Hill. At the end of the first year there is a 15 days' excursion to Normandy to see the systematic management of

French forests. During the second year there are occasional excursions for practising timber measureing, etc., the number of which is not fixed. In the third year they go for 9½ months to Germany, and they are there placed two and two with selected, highly trained Prussian State forest officers of experience, and there they remain for 8 months, having to make themselves acquainted with all the operations in forests which have been under systematic management for not less than 80 and some for over 100 years. First of all they must make themselves acquainted with the composition of the forests, and then they are instructed in the methods of thinning young wood, middle aged, and old woods. They have to mark cuttings for natural regeneration, preliminary cuttings, seeding cuttings, and learn how they are executed. They have to become acquainted with planting and sowing. They become acquainted with the cutting of timber into profitable lengths and dimensions for sale, and become acquainted also, of course, with the diseases of trees, and damage to trees, etc. At the end of the eight months I take them for a tour of six weeks to several interesting forest districts in Germany, Switzerland, and, occasionally, into France, where special systems of management, with which they have not been previously acquainted, are practised. I remain three, four, or five days in one locality, and teach them the different methods of treatment, and let them write a report upon it, with critical remarks on all that they have seen, so that their education shall be further enlarged. At the end of three years they are considered fit to be sent to India.

2291. Can you give us any information as to the value of that course as compared with any other?—I am largely interested in the course myself; but, of course, I think it is as good as it can be made under the circumstances. At the same time I think there are certain drawbacks to it. These forest officers have to take part in the general administration of the country in India. They live among the wild tribes in out of the way places, and have a very great influence on the welfare of the people in those districts, and, therefore, many of them are vested with magisterial powers. They have a considerable influence on the general administration of the Indian Empire, and, therefore, a certain value is placed upon the fact that they are trained together with other men who go out to India, with engineers and telegraph officers; and some people think it has a very great educational effect upon them. But while recognising that as far as it goes, my own personal opinion is that the more a man during his studies, as he would do at a university, rubs up against people of other persuasions, the better for him. In my opinion at a university you come in contact with people of all kinds, not only those who go in a particular groove, which has a great educational effect. You learn to know that there are people living on the other side of the hill, whereas there is a little tendency to think that "Coopers Hill is Coopers Hill, A1." That is one point. There is another drawback. The teaching of several branches of science is arranged more particularly to meet the requirements of engineering, although we are gradually eliminating that by giving special instructions to forest students. I will give one instance. In chemistry it has been lately settled that particular importance is to be paid to the heavy metals, and all that sort of thing, for the instruction of engineering students, etc., whereas those parts of chemistry which are far more important to us, than iron and steel, are not altogether so prominently brought forward. The teaching of the auxiliary subjects is rather more from the point of view of the requirements of an engineer than a forester. If our men studied at a university they would get a more general knowledge of science. For the study of forest botany, Coopers Hill is a very good place. There are woods there which are treated arboriculturally, and for shooting purposes, and so on, and there are a great variety of trees, and it could be made a good place for the study of forestry, but that is impossible, because the areas are Royal shooting grounds.

2292. But there is no wood that is well grown in the neighbourhood, is there?—Yes, there are patches.

2293. There is only one subject on which I think we should like to have your views, and that is as to the measures which could be taken by the State to stimulate afforestation by the utilisation of existing State forests, and the utilisation of additional areas?—With regard to the existing State forests, they are practically State forests and are treated from a certain point of view, principally I think for revenue, if I am correct. Mr. Stafford Howard is the gentleman who has taken an enlightened view of the matter, and is endeavouring to introduce a systematic management of the forests under his charge. Working plans have now been made for the Forest of Dean, for the High Meadow Woods, and I think it is the intention of the Commissioner of Woods to do that wherever it is practicable, where he does not consider that other considerations are of greater importance, or where excessive rights prevent this being done. I think a little more might be done in the New Forest, although the difficulties are very great. As far as I understand the present law there is a certain area which may be enclosed and kept under forest in the New Forest. I think the Commissioner of Woods ought to face the outcry which would be probably raised if these 12,000 or 14,000 acres were put under a systematic management. I think the State might in other places acquire forests as the opportunity offers. I am not exactly prepared to say where at the present moment, because it would be the subject of a special enquiry, but I think the State might acquire some areas in Scotland which might be made available as School Forests; possibly opportunity may offer in England too. Of course if it was in Ireland I should say much more, but that does not come within our enquiry.

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2294. You believe the creation of a system of efficiently managed State forests would be a good thing for the country?—Yes.

2295. One other subject. Do you think that something might be done to stimulate private effort by providing the means of forestry education and giving advice through experts, and perhaps also by advances for planting?—That goes to a great extent with what I have said as regards education. I think the State ought to assist to provide the higher education, at any rate at universities, and also give assistance for instructing and educating foresters. At the same time I do not see why the landed proprietors themselves should not step in and give help. It is in their interests, and I do not see why it should not be possible to form associations of proprietors, as has been done in other parts of the world, and get them to assist in this matter. I am perfectly certain that if the matter was put before them in a proper way a great many landed proprietors would assist in having centres of instruction. With regard to financial assistance for the purpose of extended afforestation, I have been met repeatedly, when I have suggested that, with, "Oh, it is all very well, but where is the money to come from?" I do not see why somewhat more extended means should not be made available for taking up money to be paid in the shape of a sinking fund. It might be arranged that interest is paid on the actual loan for a number of years until the returns begin to come in, and then the loan should be paid off rapidly in the course of ten or fifteen years. I have had conversations with various landed proprietors who would be only too ready to fall in with a system like that, and take advantage of it.

2296. And you think perhaps some advice might be given through experts?—I think if the State could have a sort of Inspector or expert attached, say, to the Agricultural Department or to the Commissioners of Woods and Forests, a man who was always available to give advice from time to time, or to go and inspect woods when advances had to be made, it would be very highly advisable. Of course we have Dr. Somerville, but I think Dr. Somerville has a good deal of other work to do as well. I think it would be quite worth while to have, at any rate to begin with, one forest expert attached to the Agricultural Department, or, if the management of the business was made over to the Commissioners of Woods, then to their Department. I have already stated that a good beginning has been made in some of the Crown forests to bring the forests under systematic management. The Commissioners of Woods and Forests have comparatively little to do with woods, and a great deal with ground mining rights, etc.; but I think the Commissioners of Woods might take into consideration that there should be, at any rate one local assistant fully trained in forestry at each centre of operations, such as the Forest of Dean, and the New Forest. Mr. Stafford Howard has appointed one assistant to the Forest of Dean, but I think another one at the New Forest would be very useful. It should be a recognised thing that one

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of the assistants should be a thoroughly well-trained forester.

2297. I think that everybody who is interested in forestry would agree with that?—I think Mr. Stafford Howard himself will do that.

2298. (*Mr. Stafford Howard.*) A good deal of work has been already done?—It has been done already in one place, but I should like to see the principle recognised, because you may not control the Department much longer, and your successor may hold different views.

2299. You have given us certain areas which you say are or might be available for planting, some of them not recognised in any way as being used for agriculture, and others which are used for grazing. With regard to those not used for any agricultural purposes, I should think they would be probably the most inaccessible?—Probably so.

2300. In mountainous districts?—Probably there are also a great many which are bog, peat, etc.

2301. Therefore it is probable that a good deal of it would not be suitable for planting?—Probably, only a certain proportion would be suitable.

2302. And it might be difficult to find any large area in one place suitable for planting?—What do you call a "large area"?

2303. A thousand acres?—Do you mean in one spot?

2304. Practically in one district?—Of course that might be, but if blocks of some 500 acres and upwards were available, it would be sufficient for economic working.

2305. You were suggesting that the State should acquire land for the purpose of planting. It would not be worth while the State acquiring a little plot here and a little plot there?—I should have a limit. I do not think that operations on small areas would ever be financially productive. In my publications I have generally spoken of 500 acres and upwards.

2306. If these places are very inaccessible you would require to make the access better and spend a great deal of money, and it would not be worth while doing that unless you had a sufficient area to do it with?—That is no doubt true; if they were scattered it would involve extra expense.

2307. And would it be less likely to be profitable?—It would be less likely to be profitable.

2308. With regard to the other area used for grazing, you instance a fact that some large towns have acquired considerable areas and have got rid of the rights of grazing, and I think you drew the inference from that that the State might possibly do the same thing. But these areas are required for the purpose of supplying these towns with water, and the whole expense is borne by the rates in these towns. They do not take into consideration the question whether it will pay. It is absolutely necessary for them to have it. While it might be possible for these people, having this area, and having got rid of the grazing, or what rights of the people there are on that area, it would be quite a different thing for the State to get rid of people by Act of Parliament for the purpose of planting?—I have limited my proposal with regard to the State action within reasonable bounds. Where the difficulties are very great I would not attempt it. There are areas found here and there over the country where the difficulties are surmountable. In all my writings I have made that a point. I would not disturb any agricultural operations. Where any heavy pressure has to be brought upon the surrounding population it would be probably advisable, at the present time at any rate, not to attempt anything. There must, however, be many areas where the difficulties are so small that they can be overcome.

2309. I do not think in my experience in those districts which are subject to grazing rights, which I am speaking of now, the difficulties are so slight in any of them?—You are thinking of Wales, I think.

2310. I think you will find the difficulty is pretty much the same everywhere. I know a good deal of the Northern Counties as well as Wales, and the same thing would apply to both. My opinion is that the limit you put upon it is so much as to practically exclude the greater part of the millions of acres of which you have spoken?—Of all those areas probably a couple of millions would be situated in Ireland, and certainly another couple of millions would be situated in Scotland, and here in England I would restrict the operations of the State in the first instance to a few areas required for instructional purposes, and I would in England rely more on the landed proprietor.

2311. It is quite possible where one large area may be in the hands of one owner that you may make an arrangement there by voluntary agreement or by purchase, but where you have a number of owners concerned, as is the case in these large areas, I think the difficulties would be very great indeed?—I think you over-estimate a little what I say about the acquisition by the State in England. I should be very cautious with regard to the acquisition of areas by the State in England.

2312. That is what I wanted you to say?—I think it is worth while, if the areas now at its disposal are not suitable for instructional purposes, for the State to acquire a few areas which could be made available for instruction.

2313. In different places?—In suitable places where they are required for the purpose. As far as England is concerned, my proposal for State action is very limited.

2314. You have given us your idea of what forestry instruction should be, and you lay great importance, with regard to the instruction of owners and the higher class of land agents, on the fact that if possible it should be in connection with one of the Universities. You also lay great stress on the necessity of practical demonstration, and therefore you would like to see an instruction forest, as the Chairman has called it, of sufficient area, within reasonable distance of one or other of those Universities, if it can be so arranged?—Yes. I have said, with regard to University students, that the question of the distance is not of the same importance as in the case of the instruction of men of limited means. Whether you go an hour by rail or two hours by rail, after all, the distance would not be insurmountable, and excursions could be arranged to extend over several days at a time. I should like to have it as near as possible to the University, but if it is not obtainable within an hour of the University I do not object to two hours.

2315. What you would like to see is an instruction forest of sufficient area, and showing sufficient variety, large enough to employ a certain number of practical foresters who would be anxious to learn for estate purposes on various estates in the country, and at the same time such estates would be available for the higher class of students coming from the Universities?—It would answer both purposes.

2316. Who do you propose should manage the area?—You must have a competent manager, of course, otherwise you fail to begin with.

2317. Is it to be in connection with the University—would the University appoint someone?—That, of course, would be a question for inquiry, and that is where I want the State to come in in England. If two, three, or four estates, either belonging to the State already or having been acquired by the State, could be made available for instruction, I should expect that a competent forester would be put in charge of those estates. We might commence by a retired Indian forest officer. As you know, we have a number of men who retire at the age of 45 years and onward, with a pension of £450 or £500, and if you offered these men an additional appointment of £300, they would be most happy to take it.

2318. It would be used really and truly as an instruction forest, and not necessarily for the purpose of making profits?—I should at once begin to put it in a way that it would give the highest possible profit derivable from the area—most decidedly.

2319. You would combine the two?—Yes, you can combine the two. They are combined everywhere on the Continent.

2320. But it is very desirable, supposing this establishment at Oxford or Cambridge, that those who give instruction to the students should be in touch with the man on the spot, the manager?—Yes. It might be so managed that the whole of the management could be controlled by the Professor at the University. Let me give you an instance. Last week I was at one of the principal German forest schools, and there the director of the forest school is also the officer who controls the management of two ranges, each comprising about 5,000 hectares. They are managed for profit, but at the same time they lend themselves to the purposes of instruction.

2321. I do not propose to go into the vexed question

of the New Forest, but I should like to make this observation, because the Chairman asked a question of Mr. Forbes the other day from which I gathered that he thought Mr. Lascelles had described the New Forest in some former evidence as being 40,000 acres of waste land. He has kindly referred me to the passage, and I see Mr. Lascelles, in making that observation, was referring to the 40,000 acres of open land which was subject to grazing right. It is commonly called in the New Forest "the waste of the forest." I wish to make that explanation because it was not quite a correct reference to what Mr. Lascelles said, I think, and possibly the Chairman may wish me to correct it?—I have put the area of forest there over which you have control at 12,000 or 14,000 acres.

2322. But the whole area of the forest is 63,000 acres, and we have the power of enclosing 16,000 within an area of something over 17,000. We can only deal with 17,000 acres, and of that we can keep 16,000 enclosed?—I see.

2323. (*Professor Campbell.*) I wish to put one or two questions in order to make certain points clear. We have had several statements with regard to the income from woods in England. Am I right in saying that you stated that in the majority of cases you think the returns are under-stated?—I did not mean to say that. What I mean to say is, that the majority of the woods are not made to yield that quantity of timber which they are capable of yielding. If you manage a forest so as to get 30 cubic feet a year out of it, and it could be managed so as to get 50 cubic feet out of it, it is not fair to say that the forest will not pay, as you do not manage your forest to get the largest quantity of timber out of it.

2324. I think you stated that the figures were not reliable?—There are so many things charged against these forests. I mentioned roads, rides, and fences, which practically have nothing to do with it.

2325. That led me to assume that you thought these figures were usually under-stated, and that the woods would yield more?—No. The figures represent things from which you cannot draw a conclusion as to the financial results. That is what I meant.

2326. You also said that you did not recommend the use of agricultural land for woods. I suppose by agricultural land you mean land that is under crops—tillage land?—Tillage land and the real grazing land. If a person came forward who was the proprietor of a farm, and said "Will you buy my farm and put it under forest?" I should accept it, of course, but I do not count on that. I do not want to take a single acre of land out of cultivation.

2327. But that was what you had in your mind when you used the word "agricultural"?—Yes.

2328. We have had some evidence with regard to the upper and lower limits of altitude between which you can plant. You did not touch upon that in your evidence?—I gave you my opinion about it. I have occasionally put forward certain figures, but they only refer to certain conditions. It is absolutely impossible to say here in this room what is the uttermost limit, as it depends on the agricultural conditions, the nature of the land, what it can produce, etc. I think one may get into a very false position by making any statement in a general sort of way.

2329. So that the figures we had from previous witnesses should be only taken as applicable to the land that they were speaking of, and not generally?—They may be applicable to certain cases, but you could not build any theory upon them—or at least, I do not think so. May I illustrate my point? I put forward a case in my book; I said: "It is profitable to put land under forest which is capable of producing a ton and a half per acre of coniferous timber in the year on an average situated within 100 miles of a mining district, provided the rent is not more than 11s." You cannot make a general statement. I only want to guard against being misunderstood.

2330. I suppose that if the State is to plant forests it is very important to consider the position with regard to railways and canals, and so on?—No doubt. It depends to a great extent on the area which you have in one locality. For instance, in the wilds of Ireland there was an estate, when I was in County Galway some years ago, of 20,000 acres, which the Congested Districts Board could buy for 10s. an acre. If the Congested Districts Board had accepted that, and planted the greater proportion of that area, it would have required by and by a small branch line to connect it with the County Galway Central Railway. These are all things which depend entirely on the local conditions, and you cannot make general statements.

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2331. Did I understand you to advocate State forests in this country (quite apart from a forest to be used as a school) in the interests purely of the production of timber?—As matters stand, there are absolutely insurmountable difficulties in having anything like a large proportion of State forests in this country. Therefore what I hope is, that by giving the means to landed proprietors and the better class of land agents to become acquainted with the principles of forestry, the landed proprietors themselves will extend their operations. There was a proposal publicly expressed, two years ago, that Parliament ought to devote for the next 100 years a million pounds a year for the purpose of purchasing land to make six million acres of State forest, but that, of course, is utopian. We want the proprietors of the land to learn that the thing can be done economically, and that it will pay in the long run. That does not refer to Ireland.

2332. Of course, this inquiry does not extend to Ireland, but in view of the efforts made by the State there I think it would perhaps be well if we had your views with regard to the cause of any failure that has attended the operations of the Congested Districts Board. Such failures may be put forward as an argument against the State entertaining further schemes for planting waste land?—As our time is short, may I suggest that I submit this pamphlet? It is all written down here, and some portions may be suitable to go into the Appendix.

2333. (*Chairman.*) I think it will be very desirable to have either that pamphlet or the essential parts of it printed?—If you will spend any time upon it now, I am ready to answer any questions.

2333*. (*Professor Campbell.*) You could perhaps briefly tell us the cause of the failures in Ireland?

(*Chairman.*) It is a little outside our Reference, perhaps.

(*Witness.*) Yes, but I might give it shortly. I presume you refer to Knockboy? Knockboy is situated on the west coast of County Galway, directly facing the sea, exposed to strong gales, and especially to the salt spray carried inland by these strong gales. The failure there is due partly to the salt spray carried inland. I may mention that in the month of July, when I was there, a gale sprang up, and during the night the effect of the salt spray was such that all the needles of the pines next morning had red edges round them. That occurred over and over again. Then, of course, there are heavy westerly gales to which the district is exposed, and the excessively boggy nature of the soil. What I said was this, that if they had gone just on the other side of that hill, and had taken an estate of 500 acres, so that one hill range would have intervened between the strong westerly gales and the salt spray and the plantations, they would probably have been successful. I also took a great deal of trouble to clear up the matter of the bog question. I took a special journey at my own expense to North Germany, and examined plantations on boggy ground, and I found that you could not plant successfully in boggy ground if the depth of the bog was more than 1½ yards unless you let the land lie for a series of years after draining. I found there a bog 25 ft. in depth, and I found spruce wood 54 ft. high 42 years old, mean diameter about 12 in. at 4 ft. from the ground. I found oaks 45 ft. high at the same age, with a diameter of about 16 in. But that was boggy land which had been drained many years ago, before it was planted, and had settled down. On the other hand, where fresh bog was taken in hand in another place, I found that you could at once spot the places where the bog was deeper than a yard. You had only to look at the trees, and you found the depth was 4 to 6 ft. Up to the depth of a yard bog does not interfere if properly treated.

2334. (*Professor Campbell.*) The point I want to get at is this, that the results obtained in Ireland should not in any way be taken as evidence against State forests in England, the failure being entirely due to unfavourable circumstances?—No, certainly not.

2334*. It will be so stated?—Certainly it should not be.

2335. It will be advanced as an argument against using State money for growing timber, but you would

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not for a moment let such failures weigh with you?—No. I told the Congested Districts Board that it was a blunder to begin in that place, and that they should have taken good advice before starting. They started it, and when the thing went wrong they came and said, "Will you come and tell us what to do?" I told them to take good advice before it was done, but they knew all about it, and one of the Land Commissioners went for a fortnight to Austria, and came back, brimful of knowledge, and started the thing. When they had worked at it for three or four years, and it went all wrong, they asked me to come and look at it, and I said, "You would have done better if you had asked me to come when you first started."

2336. In fact, the failure at Knockboy is the very best evidence we have of the need of trained experts in this country?—Very much so, indeed.

2336.* There is one point about the German woods upon which I should like to have your opinion. We have heard a great deal about game; does game affect the woods there?—Until quite lately rabbits have been very rare in most of the Continental forests, but they are coming in more. But we have another thing on the Continent that is dreadful, and that is the red deer. In some of the woods of which I have given you the financial results, I have seen woods where every tree was barked by red deer. Quite lately there has been a law published in Prussia that red deer are to be kept within certain limits, and above all that there must be a proper proportion between the sexes. The most damage is done really by the old hinds.

2337. Then it has also been urged by one witness that the land there is very regular, and lends itself to a system of regular cultivation, and that in this country the same results could not be obtained. I suppose this simply means that in Germany you can have your areas nicely laid off in parallel strips. In this country you could have the same thing, only perhaps not quite so regularly laid out? Is it the case that in this country the land is not uniform enough to demonstrate the Continental system?—This is not the case as far as I am acquainted with Germany.

2338. It was stated that the land in Germany or in these Continental forests was much more uniform?—I have given you an example of 4,000 acres which lie between 1,500 and 2,700 feet above the sea, on steep slopes.

2339. Are these slopes uniform?—I do not quite follow you.

2340. There may be a uniform decrease in the depth of the soil, for example, as you go up?—There is no great difference between the soil in this country and the soil in the Continental countries. You can find all sorts of conditions here as well as there.

2341. But you would not say that the land in England is as uniform as the land in Germany You can get a stretch of uniform land there which you cannot get here?—You do not get uniform stretches of land on the Continent. I have never seen them, unless in land where there was a stretch of sand dunes or anything of that sort. All German forests are practically classified in five different quality classes. Some of them produce perhaps 10 cubic feet per annum, and others produce 150 cubic feet per annum.

2342. You have large tracts of land in Germany on the same geological formation, have not you?—Not more so than in this country.

2343. But very much larger than in this country?—I do not think so, not as far as forestry is concerned.

2344. And the contours of the hills there are not more regular than here?—Probably in the hilly parts it is steeper than it is here. If you go to the Jura Mountains you will find some very steep hills.

2345. You are of opinion that there has been a considerable increase of interest in forestry during recent years?—There is a certain amount of increase, no doubt.

2346. And if we could by any means increase that interest you think it would go a long way towards causing landlords to plant?—That is one of the most important points, to stimulate interest in extended afforestation.

2347. And you think we want more literature, more conferences, more discussions, more schools, and more education generally?—Yes, as a general proposition.

2348. Have you made out any estimate of the cost of a Forest School?—No, I have not at present. I had one in a previous case, but that was under different conditions.

2349. But that could be done?—Yes, very easily.

2350. Would you have classrooms attached to this Forest School?—Which Forest School?

2351. If we start one in this country?—I have suggested three different kinds of Forest Schools. You want an establishment at the University; you want an instruction room at your Model Forest, but it would not be very expensive; and at the Agricultural Colleges you would probably have classrooms enough to give a limited number of lectures.

2352. One or two simple classrooms would be required at the forest?—Yes, according to the establishment to which it is tacked on.

2353. (*Mr. J. H. Lewis.*) In advocating higher instruction in forestry you suggested Oxford or Cambridge as the centre for England, and you suggested that recent benefactions have brought the Colonies into closer touch with Oxford, and that that might be a reason for going to Oxford. Would not you say there are a larger number of landowners who go to Oxford, and that that might be an additional reason for selecting Oxford as a centre?—I have not made any choice between the two. Probably, as there is an Agricultural Department at Cambridge, the difficulties would be less in Cambridge to start with, but I believe a very large proportion of the sons of proprietors come to Oxford, and now there will be at any rate some 65 Colonials studying at Oxford.

2354. You think it is important that the sons of landed proprietors should be brought into touch with forestry education?—Very important indeed.

2355. Do you think it would be desirable to utilise for the purpose of forestry instruction, University Colleges in different parts of the country, particularly those which have agricultural departments attached to them?—That was part of my proposal, and I have already dealt with that.

2356. With regard to the very interesting evidence that you gave as to the growth of revenue from forests in India bearing out the figures that the Secretary of State for India gave me a few weeks ago, when you say that the revenue has been multiplied by 6——?—I spoke from memory, and I should like to look up the actual figures.

2357. It has been very largely increased and multiplied several times during a comparatively short period of years. You are quite sure that there has been no over-cutting of the forests, or any exceptional treatment of that kind?—I am perfectly sure that the forests are worth more now than they were 40 years ago.

2358. That is what I wanted to get out. With regard to your suggestions as to State forests in this country, I think you said that, apart from 12,000,000 acres of land on which there were grazing rights, there were 9,000,000 acres of waste land which were not subject to such rights at all?—I did not say they were not subject to rights.

2359. I think so?—No. I said they were not accounted for in the agricultural returns except under the heading of waste lands.

2360. Is it your impression, as the result of inquiries that you have made, and from what you have seen in different parts of the country, looking at the country with the eye of an expert in forestry, that there are waste lands in this country which might be profitably afforested?—I am sure there are.

2361. And could be afforested by the State?—Yes. State action would be very difficult, I think, in England from what it would be, for instance, in Scotland; but I believe there are considerable areas, though how much only a special local inquiry could ascertain.

2362. A witness who gave evidence before a previous inquiry stated that Wales contained a larger amount of waste land proportionately suitable for planting than any other parts of the country. Would you be disposed to assent to or dissent from that proposition?—I could not say offhand. I do not think it is so as compared with Scotland or Ireland. Scotland, I should say, has more, and I could easily supply information on that matter hereafter. I could not say offhand.

2363. Assuming that it were possible for the State to undertake the afforesting of suitable areas in the country after very careful inquiry and examination as to their suitability, do you consider that the unity of control,

proper and scientific management of those areas, the possibility of obtaining accurate returns and statistics as to the cost of planting and management, and as to the yield and so forth—do you consider that would be a great advantage to have on an extensive scale?—Yes; but it is rather a large budget you have given me to answer all at once. You mean to say the collection of statistical data?

2364. Let me begin at the beginning. Assuming that it would be found possible by the State to afforest suitable areas of waste land in this country, after careful examination as to situation, accessibility, and general convenience and so forth, assuming that a certain number of areas of that kind could be found, would you consider that it would be an advantage to forestry as a whole that there should be large areas or different areas under one system of scientific management in order that actual facts and data and statistics could be obtained for the information of the country generally, as they are now obtained in Continental countries?—The State forests which are likely to be established should certainly be used to the utmost extent for the collection of statistics and to serve as model forests showing the treatment of forests under different circumstances. That would be certainly a very important point; in fact, they would be chiefly useful in that respect, apart from opportunities for education.

2365. Is it your opinion that expenditure wisely made upon State forests would be likely to be reproductive in this country?—Expenditure wisely made as you say would no doubt be remunerative, or it would not be wisely invested.

2366. Do you think that such expenditure could be wisely made?—I think it could be.

2367. It could be wisely made in that direction?—Yes; perhaps I may add that I want principally the landed proprietor to go in for the business. I only want to acquire State forests so far as it is necessary either to serve as training grounds or as localities where you can collect statistics, or in some cases, as in Ireland, provide additional labour for the people. Beyond that I do not go with regard to the State.

2368. Do you think it would be possible for the State to set a good example in that respect?—Of course I want the State to set a good example in that respect.

2369. But you do not think that very large expenditure, such as has been suggested outside Parliament—I have never heard it suggested in Parliament—very large expenditure for the next 100 years would be practicable at the present time?—I have already characterised it as utopian. If you want me to go a little further I will say ridiculous. I only want the aid of the State so far as it is absolutely necessary.

2370. (*Colonel Bailey.*) I have very few questions to ask. You have said that in your opinion, with regard to the existing woods and forests of this country the most is not made of the ground, that the crops are not what they might be?—That is quite true in a large percentage of cases.

2371. Speaking generally, although there are plots here and there producing rightly, most of them are not?—Yes.

2372. This is due probably, you will admit, to several causes, first of all to sylvicultural errors?—And errors of management.

2373. Also to want of knowledge on the part of those who are immediately in charge with regard to methods for protection, for instance?—That is met by errors of management. Shall I illustrate what I mean? I have seen a wood in Scotland where an enormous quantity of timber had been thrown down by wind; but when I looked at it I found that the gentleman in charge of the forest had opened it out by cutting on the west, and when the next gale came it threw down the rest.

2374. I wanted to split the bad management into one or two items—one of them being the want of knowledge of forest protection with regard to abating the attacks of wind. Also the want of organisation in other ways. I mean such an organisation as you would make under a working plan. There is no such thing existing, and consequently the working is not done economically?—It is not done economically.

2375. Is it not a fact also that the scattered nature of the woods, in strips and small plots of awkward shape, involving immensely long fences militates very greatly against the profits?—Yes, and as regards the fencing particularly.

2376. And also with regard to utilisation, because is it not the practice that, owing to want of organisation in the felling, the proprietors cut a few trees here and a few trees there, sending many miles to fetch a little wood, a course which must largely take away from the profits which would otherwise be derived?—Yes, precisely.

2377. It is impossible under these circumstances of scattered work to make use of mechanical means of transport and such like, which might otherwise be used?—Yes, the effects of the construction of good roads are generally under-estimated. I had a case before me a few years ago where the construction of a road costing £120 would have brought about an increase in the timber of 3d. per cubic foot. It would have produced a profit of hundreds of pounds, but the road was not made.

2378. People are apt only to judge of the future of growing forests by what they see, and it is roundly stated, as you are aware, in print and orally, that there is something wrong with the soil and climate of our country which renders it less suitable for the growing of good wood than the soil and climate of Germany, France, and other Continental countries. Do you believe in that?—Certainly I do not. A great deal of the soil, as I have already pointed out, has deteriorated in consequence of too long exposure to all the injurious influences, but *á priori* I certainly do not believe in it.

2379. You do not agree with the witness who yesterday said that the land was capable of producing one crop, but that after that it was no use restocking the ground?—Those woods, of which I have given an example, have been under spruce, say, for a thousand years, and probably before; they go on cutting down their spruce and replanting it again. You will hear it stated here that when land has had a crop of Scotch pines or spruce upon it it is no use replanting with the same species, but on inquiry you will probably find that the young plants are destroyed by insects. In Saxony they catch the insects. They put pieces of wood into the ground and the insects all collect in these pieces of wood, and then they burn them, and get rid of them.

2380. Do you think it is a fair argument to use in justification of that view that natural forests, say in Central Africa, India, or any other place, do not produce merely a single crop, but that they go on for ever?—They have gone on actually from time immemorial.

2381. You have laid great stress on the importance of stimulating the interest of the landowners in order that they may take action. You have also stated that if comparatively small State areas were provided this would perhaps have some effect in stimulating their interest and showing them what the land might be made to produce. Do you not think that is perhaps the only way of getting at them, or at any rate the most important way?—That is part of my general proposal. You must have the instruction which will catch the landed proprietor, and you must have the forest to illustrate it.

2382. But do not you think it would have a great influence on the general opinion among landowners if, apart from their putting themselves under instruction, there were at least a few areas in the country where a properly managed wood could be seen if they chose to look at it?—It is absolutely essential. If you restrict yourself simply to a chair at Cambridge or Oxford you are just building in the air.

2383. It is probable that the State areas we have been talking about would have a very great effect in exciting the interest of landlords and inducing them to move?—It is absolutely essential to have them.

2384. In answer to an objection which might be raised that it would take many many years before anything could be shown, what would you say? Do not you think that even from the early times of managing an area already wooded, matters of great interest could be shown to landed proprietors?—Yes.

2385. In buying an estate with 500 acres of wood already upon it, you have not to wait for a whole generation of trees before you can show anything?—You can show something within a very short time. I will take the Duke of Bedford's lands, where I can show you the system of natural regeneration of Scotch pines by adjoining woods which was only introduced a few years ago.

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2386. Almost at once they begin to be very useful as practical teaching grounds, and also very interesting as object lessons?—Yes, precisely.

2387. We have heard that some County Councils have organised short courses of lectures. Do you think those are of very great use, and that they are likely to form an important agency in instruction?—No doubt they would be very useful in awakening interest in the study of forestry.

2388. You would agree with me in thinking that no teaching of a really useful practical kind can be given in that way?—It is too short, but you can awake interest.

2389. That is my own view, certainly. You have said that you attach very great importance to the fact, that any State area which may be acquired would be useful, first of all, for education and as an object lesson to proprietors, and, secondly, that on such an area as that you could carry out researches and collect data. Do you think that the collection of data and the carrying out of researches can be possibly done on any ordinary estate?—I doubt it very much. I think I have asked some questions leading to the same point before. There is the uncertainty of the ownership. You can use them, but you must take the chance of their becoming useless as time goes on.

2390. We are agreed on the great advantage of these researches and the collection of local data which we could use for teaching purposes, and in your opinion we can only really get those data with certainty from areas in which the management is continuous, as it would be in a State forest alone?—Yes, or a Corporation forest.

2391. Exactly; I accept that. That in itself forms a most important reason why the State should acquire some forests?—Certainly, that is an additional reason.

2392. Supposing there were to be an extension of the forest area; supposing some of the 4,000,000 acres of waste land in Scotland were to be afforested; it is commonly said that would lead to a very awkward result: for one thing the beauty of the country would be destroyed, because formally grown woods are very ugly. Do you think that is a serious objection?—Personally, I do not. I believe I am in very good company, as I think Lord Selborne did not consider so. I believe that artistic beauty can be very well combined with economical management.

2393. That is the way I would rather have put it—that is what I mean. Do not you think if there were to be an extension of the wooded area, in Scotland, for example, although it would doubtless apply to every other country, this extension would be very valuable, not merely for producing timber, but also as a shelter?—Certainly.

2394. It would have a very important effect on agricultural crops, stock, etc.?—Yes, I believe so.

2395. Do not you think the labour question is very important, too?—Very important. With regard to the labour question, I find that in the Saxony State forests the labour required comes to about 8s. an acre a year—about three or four days' work.

2396. Has it ever struck you in connection with the salaries now usually paid to head foresters that the proprietors are paying very little, considering the very large capital locked up in their forests?—Yes.

2397. Do you not think that if some of them could be got to realise the value that their woods actually have, or their potential value, they would find it well worth while to raise the salary of their head foresters?—I most thoroughly believe that. Let me illustrate that. Taking that district I have spoken of, of 4,000 acres, for which I have given you the data, it has been for the last 60 or 70 years managed by an officer who had nothing to do but to administer the 4,000 acres. He has gone through a course of study extending over certainly not less than five or six years, theoretical and practical study, before he was declared fit to take charge of a range like that.

2398. In the case of the small estates owners cannot perhaps afford to pay more, but if upon the larger estates employment was offered to men more highly trained in modern sylviculture and management, this would lead to a great increase in the net receipts. Say a man has 20,000 acres of wood, and there are estates in Scotland that have much more than that, and that they are worth £50 an acre, that amounts to £1,000,000. Do not you think it would pay well to put in a highly skilled, trained man with a salary of £1,000 a year, for instance?—I should certainly have more than one skilled man on an area like that. I should probably have about three or four.

2399. Each getting large salaries?—Yes. And each can attend to the details of the management in the different parts of the woods; not leave it to a wood-cutter to carry out an important operation like thinning or anything of that sort, whereby he may easily reduce the future return to one-half.

2400. Does not it seem almost absurd to have a property worth that money, or potentially worth that money, managed by a man getting 30s. or even £1 a week?—Yes.

2401. You know as a fact that such rates are paid?—Yes.

2402. You said that in the case of the school forests you would have the general lines of the management controlled by the professor at the University. Is it not the universal system in all Continental forest schools to have an area attached to the school for purposes of instruction and managed under the control of the director of the school?—It is not universal, but it is so in the majority of cases. Where it is not the case, the chair of forestry and the forests which are used are under the same authority.

2403. Is it not very difficult for a professor at a college or university to take classes for practical instruction to an area with which he has nothing to do, owing to the friction which might ensue?—There would be in this country, because nearly all the forests are private property. On the Continent the question does not arise, because a very large proportion of the forests belong to the State, and as the State also has the University, it orders the local officers to give all possible assistance.

2404. I will give you particulars. Supposing you had a State forest attached in some way to a class in Edinburgh. Would you not think that, even though that area belonged to the State, certain difficulties might arise if the director of the arrangements at the University had not something to say with regard to the control of the forest?—He must have the general control. It might be easily arranged if he is answerable to the Government.

2405. You said just now, in answer to Mr. Lewis, I think, that the State area would be certainly managed for profit. Would not you go a step further and say that if it is was not managed for profit it could not form an educational area?—Precisely.

2406. You would have lectures given to the men who were under instruction, the apprentices?—Yes.

2407. No doubt they would have to be housed on the ground?—Like labourers.

2408. And you would have some very modest provision in the way of lecture-rooms and some collections and objects to show in illustration of the lectures?—Yes, quite elementary.

2409. But there would be no very great expenditure incurred in fitting up such an establishment as that?—I should not think so. I wish to qualify that in one way. Those who really make sufficient progress may afterwards be given facilities to prosecute their studies at an agricultural college, or wherever they took the scholarships which Dr. Somerville spoke about the other day.

2410. I think the question was asked you as to what extent of ground you would take. I rather think you said you would limit it to the charge of one man, mentioning 500 acres?—No, that was with regard to the formation of State forests generally. I think 500 acres is not nearly enough.

2411. I want you to say what you think?—That is one of those questions which are difficult to answer, but I think there should be an area of a couple of thousand acres. The more the better. If you can buy an estate, the bigger it is the better, so that you would get sufficient variety.

2412. (*Sir John Rolleston.*) I am one of those who have been all their life endeavouring to persuade people to plant timber, with very indifferent success. We have heard a good deal of evidence on what was called waste land, 1,500 or 2,000 feet above the sea level, unenclosed land. Twenty years ago there was an enormous amount of land thrown up by the occupiers of this country, strong plough land, and land of that character which has run down to poor pasture, and as they say in our part of the world "will not keep a goose to the acre" now.

Would it not have been better to plant that land than let it lie idle or run down to bad pasture?—I am perfectly certain it would.

2413. I am glad to have the justification of so high an authority?—I am certain that it would.

2414. These waste lands were fenced already, were on main lines of railway, and in the very heart of England, where the timber could be got away easily, and it would have been very much better financially to-day if they had been planted?—Of course you must understand that this is only quite in a general way, because I think these lands have probably deteriorated in quality ever since.

2415. Would not you call land that is fenced and drained and has roads through it and which only lets at 2s. 6d. an acre a failure as land?—Land which was under cultivation?

2416. Yes?—I should think you would probably have got three or four times the revenue out of it by putting it under forests.

2417. It is much better economically to grow timber of that sort on land than to endeavour to grow food upon it?—I do not want to take a single acre out of land which provides food for the people, unless it is voluntarily thrown up.

2418. But the people do not want the food; they will not buy it?—If they throw it up let us take it by all means.

2419. People will not buy the food when you do produce it; they buy it from Chicago and places like that. Is it not better to encourage the growth of timber economically which will give employment to people than to encourage the growth of food?—You are touching a question now which is a very large one, and on which I hold some views. Are you sure that the corn from Chicago will come for ever? Are you aware that enormous areas of the United States of America from which we get such enormous quantities of produce were to a very large extent virgin lands, where comparatively little expenditure has had to be incurred to produce the crop? Are you also aware that the virgin land, at any rate in more accessible places, is getting less, and in many parts of the United States they have now to begin to spend as much labour and manure on their land as we do in this country? Are you aware that the time may come when the United States of America may not be able to send us grain in the same way they have sent it to us till now? Are you not aware that the price of grain and bread in this country may, and probably will, rise again, and that land will also rise in value again?

2420. Mr. Cecil Rhodes said that the land of this country can feed 6,000,000 people. We have more than 6,000,000 people, and therefore we must look to get that supply from somewhere else?—I am afraid I am not prepared on the spur of the moment to contradict the late Mr. Rhodes, but I hold a very strong opinion about this cheap grain. I think the time will come when the grain will rise again proportional to other articles of necessity.

2421. But the supply of timber is decreasing, I think you said?—I have given evidence of that already. I believe there will be a greater and greater difficulty in getting the necessary timber.

2422. And which could not be made good in less than half a century?—If once a deficiency has set in it will take a long period to make it good.

2423. Therefore it is better that the poor land of this country should grow something for which the demand is increasing rather than an article for which there is hardly any demand at all?—All the less valuable land would probably give a better return if put under timber in this country.

2424. And therefore the landowner in planting this poor land of his may look to be planting a crop of which the value will increase?—I have no doubt about it, if the operations are carried out economically. That is the great point—the operations should be carried out economically, with no fancy prices for work and management.

2425. In that connection, in speaking about the education of the landowners, agents, and foresters, it seems to me that what landowners require, what is wanted, is a consulting forester. Supposing a landowner desires to plant 200 or 500 acres, the man he would want is the man who could superintend that planting from beginning to end?—Yes.

2426. We want that class of man, the consulting forester; we do not want to employ a man permanently?—If anything of the sort I have suggested was introduced you would get a number of forest experts amongst the land agents. Of course I need not tell you that there are a small number of such gentlemen who devote their time to advising landed proprietors, and you would have men who were capable of advising and giving sound advice with regard to the possibility or otherwise of afforesting certain land. You would have a supply of men of that class. *Professor W. Schlich, C.I.E., F.R.S.* 25 Apr. 1902.

2427. That is very much needed, is it not?—Yes. Many of these gentlemen would probably have the control of a number of small estates, and devote a portion of their time to each. I think that is the important point. Given a man who has 200 acres or 300 acres, and who keeps a forester, he would have besides the share of an expert who came to him three or four times a year, or perhaps a week at one time and a week at another time, and looked into the details of the work. I think that will be probably the result.

2428. A great many of our timber trees are exotics, are they not?—Of course a great many of them are, but that is rather a ticklish question. There are certain trees which are supposed to be indigenous in this country, and there are others which we know are not; the larch is an exotic tree, and the chestnut and the spruce.

2429. What I was going to ask you is: do you know any other exotic tree or shrub; not for the purpose of timber, but like cinchona, india-rubber, or anything of that sort, which may be planted profitably in this climate?—Neither of those two you have mentioned would thrive here.

2430. Is there anything which the scientific people of the day might direct attention to for planting in this country?—You open a very large question. Kew does a great deal of investigation into that matter. If you ask about particular timber trees I can give you an answer, but about things like cinchona and india-rubber I do not think I ought to say anything.

2431. It is in connection with forestry I think. Is there anywhere in which the land of this country could be employed better than it is at present?—Do you mean by growing any other crops?

2432. Yes; trees grown on poor land can be grown to much better advantage than food?—I think it is highly important that experiments should be conducted with the object of finding perhaps trees or other plants which will do better than those we have, and those enquiries are being prosecuted, but that is all done by the Botanical Department. Probably there is nothing so profitable as larch if it were not for the disease. On the other hand, where you can grow the Douglas fir profitably you probably get double the rent from your land than you get from any other forest tree in this country. I think in this country we have means, where the ground is suitable, to make very high rent by growing ash. Ash is a paying tree. I am afraid this is a very large question, but I am ready to go further into it if you wish it.

2433. We may still with confidence recommend landowners to plant timber as being likely to be an increasingly profitable crop?—I think so.

2434. (*Mr. Marshall.*) With regard to the relative quantities of woods grown in England and on the Continent, first of all as to the relative qualities of fir wood under the Continental system, close together, and that which is grown in England, we have had it in evidence that the Continental wood is so much preferred to the English wood on account of its being cleaner, and better grown, and not so rough, and that the miners prefer it, but we have no evidence at all beyond something that Mr. Margerison said as to the respective qualities of it. Do you think that pitwood can be grown in England of as good a quality as it can be grown on the Continent?—I think so. You must remember there is one particular point. It is generally assumed that the pitwood here in question means Scotch pine or perhaps spruce, and it is generally assumed that this timber with large rings is generally less substantial than timber with small rings. If you grow timber close together you get coniferous timber with narrow rings, and probably get a somewhat better quality. If you grow your trees in this country with just the same limited space you will probably get trees which have annual rings, which are not larger than those of the timber brought in from the Continent,

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except that in some respects the trees in this country will altogether grow somewhat quicker, than around the Baltic. It is rather a complicated question.

2435. With regard to the quality of beech. You heard Mr. Margerison's evidence about that, in which he said that for some purposes the foreign beech was not so good as English, and he gave us evidence to prove that a tree which has more room has more density and toughness?—With many broad-leaved trees it is the other way round: here broad rings probably indicate better quality; it is just possible that the quality may be somewhat superior, but I do not think the difference is very great.

2436. The reason I ask you this question is this. If we are going to persuade landowners in England to plant on the Continental system they will want to know whether they can plant in as good a way and grow timber of as good a quality, suitable for the market, in England, as the imported timbers now coming into this country. I wish to ask you about one thing more. You said with regard to the system of planting larch in beech woods that it prevented disease. I did not quite understand you. Do you mean that you would plant out larch in open spaces in beech woods or start the woods altogether and put larch and beech together?—The system has been developed to this extent. They commenced on the Continent to put the larch singly into woods, dotting them here and there, but lately they plant small groups of larch or little patches amongst the beech wood. The disease probably will be less then for two reasons. In the first place if the disease breaks out in one patch it does not follow that it would spread to the other patches, and, secondly, by putting the larch amongst the beech wood, you give it the best possible conditions you can give it to grow vigorously. The more vigorously the larch develops, the more likely it is to resist disease. Probably, the enormous extent to which the larch disease has spread in this country is due to the fact that it has been planted too indiscriminately on areas where it should not have been planted. Generally speaking, the larch disease in Germany is as bad as it is here.

2437. Do I understand that the larch is planted in the beech afterwards?—The beech on the Continent is regenerated naturally, and when the natural regeneration has been obtained they plant groups of larch into it, or sometimes they begin with little groups of larch and then regenerate the beech.

2438. To some extent you do away with the natural regeneration of the beech wood, because it cannot regenerate while you are growing larch there?—But the larch occupies only a small portion of the area.

2439. (*Dr. Somerville.*) You have supplied a definite scheme on which we ought to be quite clear as to the issues involved, as it will create great attention. You have indicated that what you think would satisfy the requirements as regards higher education would be the establishment of a Faculty of Forestry in the University of Edinburgh, and another in one or other of the two leading Universities of England. By a Faculty of Forestry I suppose you mean not only a Chair filled by a man who would give instruction in sylviculture, but another Chair filled by a man who would give instruction, we will say, in forest mensuration, and another who would deal with working plans, and so on? I take it that is your idea of a Faculty?—I do not know whether we need go quite so far as that in the beginning. I think you might, to give the thing a start, begin with one Professor, or at the outside two.

2440. And perhaps to begin with you would be satisfied by not going so far as a Faculty of Forestry, but rather having a Department of Rural Economy, with forestry in its proper place?—I have already indicated that fact. For instance, it might be combined with Agricultural, or Rural Economy, if you like the term better. There might be one Degree or a Faculty of Rural Economy, but you could take it in one or two ways: you could take it in one way with agriculture as your principal subject and forestry as the second subject, or with forestry as the principal subject and agriculture as the minor subject. You generally have in these Faculties to take a certain number of subjects. I must say I have not worked this out in detail. We have had two botanists who have taken their degrees at Cambridge with botany as their principal subject and zoology as a second subject. You know a great deal more about these things than I do, and I have not gone into the actual details.

2441. One hears from people who are regarded as authorities statements made to the effect that all that one needs in the Universities is that the Professor of Agriculture or the Professor of Botany should attach forestry to his particular Chair, and that would meet the whole of the case. The old Committee on Forestry had a great deal of evidence on that point. What have you to say to such a proposal as that?—No one is in a better position to answer that question than yourself, when we get you in the witness-box. I consider it absolutely insufficient for the purpose. A man cannot serve two masters. The Agricultural Professor, if he is worth his salt, will have probably to bestow such a large proportion of his time on teaching agriculture that he cannot possibly do justice to another branch, and *vice versâ*.

2442. I suppose you would say it is nothing but a fallacy to mention that forestry can be made a Department of Botany?—It is absolutely impossible.

2443. And that, in fact, many people are entirely mistaken when they think that the extension of botany to a knowledge of trees and timber is not a different thing altogether from the study of sylviculture and forestry?—They are absolutely and entirely mistaken.

2444. You are rather determined on the particular point that there should be only extended instruction in forestry of the higher type in one English University?—Yes, to begin with.

2445. I may say that I entirely disagree with you on this particular question, because if you select one University only you will, as a matter of fact, only supply the wants of about one-half of the total number of young landowners and young men who are going into the higher walks of the land agent's profession. I think we may admit that rather a larger number of young men of this kind go to Oxford than to Cambridge, but on the other hand Cambridge has shown a greater disposition to develop in this particular direction. Tradition runs in families to such an extent that a very large proportion of the landowners of England will go to Oxford, no matter what attractions may be at Cambridge in the direction of forestry education, or *vice versâ*. It so happens that in both of these Universities there is a Chair of Agriculture, but the one at Cambridge is better known than the one at Oxford. But there is in Oxford a Professorship of Rural Economy?—On paper!

2446. And now that Oxford is getting so much attention through the agency of the late Mr. Rhodes' will, do not you think there is ample room for the development of the higher education in forestry at both of these Universities?—What you say I practically indicated myself. In the course of my examination I said one as a minimum, because if you ask for too much you would probably not get anything. What I want to be sure of is that we are making a start. Nothing would please me better than to have it at both Universities, because that is the correct thing to do. But if we wish to make complete arrangements, which will really work satisfactorily at both, it would probably involve so much expenditure, etc., that it would fall to the ground altogether. It ought to be at both Universities, and at least in one place in England. I think we must start both in Scotland and England.

2447. We shall no doubt receive evidence from Cambridge on this particular subject, but, speaking from my knowledge of the places, and some small acquaintance with University life generally, I think it is just as likely that we shall see instruction developed at both places as at one only, and I suppose that you would think that distinctly an advantage?—That is what ought to be, but we must take what we can get.

2448. There are in different parts of the country Agricultural Colleges, some 10 or 12 in England and Wales. In one or two instances these Agricultural Colleges have attempted to give instruction in forestry. I suppose you would agree that, if the instructor is qualified, a certain amount of education in forestry might with advantage be given at these agricultural centres?—That forms part of my proposal.

2449. But in some cases the men that have undertaken the instruction in forestry are men who have hitherto taught, we will say, agricultural botany only. I am sure you would not encourage the extension of that particular kind of instruction?—I think not. If there is a short course of instruction in forestry at these Agricultural Colleges it should certainly be instruction of the right kind. But you would not require a special lecturer on

forestry at each Agricultural College. One lecturer might serve several of the Agricultural Colleges in England.

2450. The supply of qualified men is rather limited; but, as you say, one or two going from place to place to give a term's instruction would probably to a large extent meet the case?—Yes.

2451. (*Chairman.*) You have stated that in your opinion you regard inquiry into the amount of waste land available for afforestation as very important; but you suggest that rather with a view to determine what the possibilities are than to suggest that the State should immediately embark on any great industry in the various areas?—The whole question turns on that inquiry as to whether it is worth while doing anything at all.

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2452. With regard to the training of students at the Universities, either in England or in Scotland, seeing that the private forests afford no adequate means of study, and that the State forests are largely composed of waste land, and that only parts of them have been recently put under methodical management, you would doubtless provide in any scheme for the students at the Universities going abroad for part of their practical course, just as they now do at Coopers Hill?—Certainly, until we have the necessary means of instruction in this country.

Mr. DUDLEY W. DRUMMOND, D.L., J.P., called and Examined.

Mr. D. W. Drummond, D.L., J.P.

2453. (*Chairman.*) You have been for some years managing property in Wales?—I have.

2454. You look after estates there of over 80,000 acres, with about 3,000 acres of woodlands on them?—That is so.

2455. You have studied at Cambridge, and at an Agricultural College?—Yes.

2456. And your evidence will deal more particularly with South Wales?—Yes.

2457. Do you think that if at Cambridge there had been provision for forestry education you would have been able to benefit by it?—No, I do not think I should, not under the then existing system at Cambridge. There are no methods of studying practical forestry there—at any rate, there were none in my days.

2458. I meant rather that if there had been provision for forestry instruction there, adequate provision, forestry classes and a demonstration area, that you could have visited from Cambridge, you would have derived benefit?—If there had been facilities, yes.

2459. Did you ever feel the want of a thorough training in sylviculture?—I have felt it very much, and noticed it very much everywhere.

2460. Do you think many land agents have the same feeling?—Yes, I think they have. I never met any that ever had much real practical experience or early training.

2461. Do you think that for the management of woodlands it is equally important to train the owner and the agent and the forester?—Yes, I think it is.

2462. All three?—Yes, all three.

2463. Which do you think needs it most?—It depends very much. Very many landlords take little interest in their properties, and leave it entirely to their agents. I think it is most important that the agents generally should have that special training.

2464. Are foresters sufficiently educated?—No, in my experience, certainly not.

2465. Have they sufficient general education in your part of the country to enable them to derive full benefit from a theoretical training in forestry?—No, I do not think the local foresters have it. In the principal estates I look after we have a Scotch forester who has had a good general education, and he has had a good practical experience of some of the leading Scotch estates, but he has not had a practical forestry training otherwise.

2466. But that, I suppose, he might get in this country?—No, not under existing conditions.

2467. Which agricultural college were you at?—Downton.

2468. We had evidence from Downton before the Select Committee in 1887. Was there any effective provision for forestry training there?—No, there was very little. Of course, there is a large area, the New Forest, quite contiguous; but at the present moment there is not very much to learn in the system at the New Forest, I think.

2469. The prices of wood seem to be low in South Wales?—Yes, they are very low.

2470. That is partly from expensive transport?—A great deal from expensive transport. The quality, as a rule, is inferior. The country is very hilly, and haulage consequently difficult. The roads in many cases are bad.

2471. Have you tried any traction traffic?—No, none at all.

2472. Do you find yourself in keen competition at the local collieries with French and Swedish pit-wood?—Yes. They import a great deal of this pinaster wood from the South of France.

2473. Is that brought to the market much cheaper from where it is grown?—Yes; it comes over at about 6s. or 7s. a ton delivered to the local Welsh ports, and our general railway rates within the county are almost double that. In all the local collieries you will see the sidings flooded with this pinaster and Scotch fir timber.

2474. There has been no attempt to compete with the railways by steam traction on roads?—No, not so far. it is a very difficult thing to organise There is hardly any landlord who has a sufficient area of wood land to justify that expenditure, and the plantations are so far apart. There is no large area that you can deal with.

2475. Have any of these wood-lands been planted for commercial purposes?—Yes, a great deal.

2476. But in too small areas?—Yes, I think so.

2477. Is there much land available for afforestation?—Yes, there is a great deal of waste land in the western part of Wales, thousands and thousands of acres of Crown Manor and other manorial waste, which could be very properly planted, bringing in practically nothing nowadays.

2478. Is there much land free of grazing rights?—No, that is a difficulty. There is very little land that has not grazing rights attached to it, and though the grazing rights are important in a way, they are really of very little actual value.

2479. Do you think that the landowners will extend the forest area to any great extent in Wales?—I do not think they will at present unless they get greater encouragement from some quarter to do so.

2480. What sort of encouragement do you think should be given?—I think some assistance in the rates might be given. I think it was a great pity woods were not brought into the Agricultural Rating Act.

2481. Why were they not, do you know?—I do not know.

2482. The rates at present are very high, are they?—Yes, between 7s. and 8s. an acre, rates and taxes generally.

2483. Is the tithe heavy?—The general rates average about 4s. in the £, and then you have income tax A 1s. 3d., B running into 5d., tithes 1s. 8d., and land tax 3d., which comes to 7s. 7d. in the £, rates and taxes alone. I think it would be very desirable if it were brought home to landowners in some shape or other how important planting is. I do not think they realise the scarcity of timber there is in the world.

2484. I suppose that what would lead them to realise the importance of it would be some evidence that the growing of wood would pay?——Yes. Then, of course, they have to wait for some years, and people nowadays in farming and arboriculture and everything look only to early profit.

2485. Do these plantations which you manage pay?—It is so very difficult to say, because there are no proper returns made. So far as my experience goes, on no estate is there any proper book-keeping kept of the various plantations. They do not stand very severe cross-examination in the accounts.

2486. You can only show what profits are by accurate book-keeping?—That is all. Still, under certain conditions, if the wood turns out favourably, and is planted in favourable situations as to markets, I certainly think

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it pays well, but, of course, it is a risky crop in so many cases.

2487. Do you think that the State should undertake planting operations?—Yes, I think they should.

2488. And I suppose you would not go beyond any tentative scheme at the beginning, because you have already said there is a deficiency of trained foresters in the country, and a great deficiency of information as to the best kind of trees and the best mixtures to plant?—There is a great deal of that, but as regards the quality of the trees, and the situation suited to them, they can be pretty accurately gleaned from local inspection. That is what I go on in planting myself. I go about the country, and see what trees suit the particular local districts best, and plant accordingly.

2489. Do you think that a good course in sylviculture at Cambridge or Oxford would be of great advantage in interesting landowners and others in sylviculture, and would equip many agents who go to these Universities for the better discharge of their responsibilities?—I think so. I think you could get a very good theoretical training there, but I do not know that these places are very well situated for practical work.

2490. You think that the practical work is very important?—I think it is very important.

2491. And it is important also for the foresters?—It is important for the foresters more particularly.

2492. From what you said, I imagine you would rely chiefly on practical demonstration for training foresters?—Yes.

2493. (*Mr. Marshall.*) You have told us that there is a good deal of risk about growing timber down in South Wales. With regard to larch disease, do you get that badly there?—We have had it very seriously, but the trees have recovered a good deal from it now. Five or six years ago we had a very severe attack of it.

2494. Have you tried mixing other trees with larch, or do you plant larch plantations clear?—I almost invariably now mix the trees.

2495. What do you plant with larch?—We generally plant Scotch firs, and *Laricio* I am going in a great deal for.

2496. Do not you find *Laricio* very slow?—Very slow at starting, but they quickly grow, and stand in places where others will not stand at all.

2497. Have you tried Douglas at all?—Not to any great extent. I had the intention of doing so, but I cannot say I have done so yet. But all the spruces do remarkably well in our county, and I think it is a great pity more are not planted.

2498. You say this foreign pit-wood comes in and spoils your trade there, blocks up the coal pits—chiefly pinaster and Scotch fir, and you also say that they get it over at about 6s. or 7s. a ton?—Yes.

2499. Therefore you find it impossible, owing to the high rates of railway carriage, to compete with it? Do not they give you a better price for larch for pit-wood than they do for foreign wood?—Yes, it commands a better price than the foreign pit-wood, but the latter, like all foreign agricultural products and everything else, is beautifully prepared for the market. All this pit-wood comes in cut to the exact size required, and is put straight on to the trucks, and goes to the collieries without any cutting about.

2500. With regard to rates, you have kindly given us particulars which amount to 7s. or 8s. an acre, rates and taxes altogether, and I think you said you were very much of opinion that the wood-lands should have been on the same standing as agricultural land when the Agricultural Rates Bill came in. Do not you think you might go a little bit further than that, and suggest, for the relief of proprietors who are prepared to lay out some money in plantations, that they should be if possible relieved of rates altogether for a period of about twenty-five years?—Yes, until some income is derived from the plantation I think it would be only fair.

2501. Twenty-five years would be about the time?—You might expect to make a little then.

2502. You would not get it out of your larch and fir plantations at ten years old?—No, and in twenty-five years you would only about keep up the working expenses.

2503. We had some interesting evidence yesterday about the mountains which were leased to the tenants for their sheep runs, with the land that lay below, and Lord Glanusk, who kindly gave evidence on the point, was very much of opinion that it would be a most unpopular thing to take the runs away from farmers and plant them?—No doubt it would be. I mean that the actual financial loss would be small, and that the gain to the country would be generally very great. That is the way I look at it. No doubt the local farmers would rise up in a body against it.

2504. What would be the result supposing a farm down there fell in, and you only let the low-lying land, and took away the sheep portion?—In many cases you cannot enclose the mountain land.

2505. Is it Crown land?—Whether it is Crown land or belongs to the lord of the manor, as a private individual, is just the same. The farms adjoining the mountain have rights of pasturage on the mountains, but they are only exercised in the summer. In the winter time the stock have to come down on the low farms. Each of the farmers can only maintain on the open mountain such an amount of stock as he can keep on the small holding during the winter, and the class of sheep are very inferior, and their value is very small. They average about 12s. or 14s. each for a full-grown sheep.

2506. I see you also advocate a bounty. Do you think a bounty would work? If the Government gave a bounty on every 100 acres of wood land planted by private individuals, would it help?—I think it would conduce to planting.

2507. That would be really a more practicable scheme than the relief in the rates, do not you think?—Perhaps it would be. I do not know whether it would be so easily obtained.

2508. As far as labour is concerned, I think you mentioned that the labour is not reliable?—The greatest difficulty we have to compete with is labour in Wales at the present time. Labour is very dear and very inferior, in fact, you cannot get labour for love or money at all down there.

2509. You say that you can occasionally get the nurserymen to take a contract?—Yes, occasionally, in certain parts there are one or two small nurserymen who do that.

2510. Would not planting be done by contract through nurserymen as well as it is done by your own woodmen?—No, I do not think it is.

2511. They would be likely to put in a lot of plants that could not be sold to anyone else?—Yes, I think one's own staff is more dependable—on small estates they do not keep a proper staff.

2512. On the fencing question, Lord Glanusk rather astonished us yesterday with the price of his fencing. He said he could not put an ordinary six-wire fence round a plantation under about 1s. 3d. a yard?—About 1s. a yard is the price.

2513. That compares very highly, indeed, with the cost of the fencing in Scotland. Do you consider that, supposing you fence off a bit of land for the sake of planting, the cost of the fencing should be borne by the wood-lands, having regard to the fact that trees would not walk away by themselves—you only have to put up a fence to keep things out. Should not a part of the cost be borne by the agricultural land, and not be all charged to the woodlands? Would it not be a fair thing to do that?—I do not know that it would be quite fair. If you are going to fence in a certain amount of land for the purpose of forestry, you ought to charge it to that department. No doubt it would be a greater relief if it could be devised in some other way.

2514. Your young woods in South Wales are a great deal damaged by sheep getting in, even though you do fence?—Yes, they are.

2515. And there is a difficulty in keeping them out?—Yes, it is a difficulty.

2516. (*Sir John Rolleston.*) You said that grazing land in South Wales would be much more profitably employed in growing timber than in agriculture?—Yes. There is a great deal of this mountain land which is grazing pasture let out at from 9d. to 1s. 6d. an acre. Even under the worst conditions of forestry you would get something more out of it than that.

2517. Timber would be a much more profitable crop?—Timber would be a much more profitable crop, and a great advantage in the way of shelter in the uplands, by sheltering sheep-walks. What the tenants would lose in many cases by certain areas of land being taken into

forests, I believe they would gain very much in the shelter which those forests would afford.

2518. You import pit-wood timber very largely from France and Sweden, do you not?—Yes, mostly from French ports. These little sailing vessels come into the local Welsh ports for anthracite coal. I may say that about 75 per cent. of the anthracite coal, which in the eastern part of Carmarthenshire is a very large industry, is exported, and these little French sailing vessels come over and fetch this anthracite coal, and bring French pit-wood to this country as ballast.

2519. If your hills were planted you would be able to supply that demand yourselves?—Yes, a great deal better than we can now.

2520. Has the rain-fall any bearing on the growth of trees?—Yes, I think it has. I think the excessive rain-fall that we suffer from is against our plantations.

2521. In your statement that you have kindly furnished to the Committee, you say that the rain-fall is somewhere between 35 and 50 inches?—Yes.

2522. And that is against tree-planting?—I do not know that it is absolutely against tree-planting, but I think the excessive rain-fall we have is against the promotion of healthy growth. We get too excessive a rainfall as a rule, and the soil is heavy clay shale mostly.

2523. (*Colonel Bailey.*) The pit-wood that you speak of as grown locally is chiefly larch?—Yes, it is chiefly larch.

2524. Is it altogether larch?—Not altogether; there is a certain amount of Scotch fir and spruce sold as well, but the larch is the only pit-wood that commands the best value, and it does command a very good value.

2525. You said, as I understood you, that you thought it was a pity more spruce was not planted?—I do think so.

2526. What would that be sold for?—It can be sold for planking very well, and for building purposes generally. There is no reason why we should not grow as good spruce as what is imported into this country from abroad.

2527. Is a good deal of spruce wood actually imported now?—A great deal.

2528. For what purpose?—For building purposes very much, and there is a great rage for building in my district.

2529. I believe that there is a feeling with a good many people in this country that we cannot grow good spruce. I hear it said very often that it is no good growing spruce; is that your experience?—No, I find spruce growing most luxuriantly. It branches out and gets knotty, but that is the fault of the system under which it is grown.

2530. Is not a good deal of that land, which I believe is wet land, good for spruce rather than for larch?—I think so. I have gone in for them a good deal myself, planting more spruce than larch lately.

2531. (*Professor Schlich.*) With regard to the grazing rights of the farmers, do you think the difficulties would be altogether insurmountable to get an extended area of afforestation in South Wales? Of course the farms have grazing rights, and these rights are simply conferred by the lease of the farm, are they not?—No.

2532. They have proprietary rights?—They have rights of occupation connected with the farm. Very often the farm is owned by one person, and the commons are vested in another person.

2533. Belonging to another proprietor?—Yes, another proprietor as lord of the manor, and the occupant has inalienable rights to the pasture on the open mountains.

2534. So that it would be difficult to get hold of these areas for additional wood-lands?—I do not think it would be difficult.

2535. Would it be insurmountable?—I do not think so.

2536. We had a case in the catchment area of the Liverpool Waterworks, where a large area was cleared entirely of these rights?—That is so.

2537. Do you happen to know whether it was a very expensive process?—I do not know the details of it, but I know it was so, because I have been in that district.

2538. You do not know whether it was very expensive?—I cannot remember the details offhand, but I see no great difficulty in regard to it.

2539. At any rate, you see no difficulty in a portion of these grazing lands being put under forest?—No. It would be a good thing to have some experimental plantings made in those large areas, and it could not affect the grazing rights at all; it would improve them in many cases vastly.

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2540. In your memorandum (*Appendix X.*) you say that there is little intelligence shown as to the selection of trees for particular situations, and a lamentable mismanagement generally in their subsequent treatment?—That is so.

2541. That is your experience as manager of 80,000 acres in South Wales?—Yes.

2542. That is certainly your experience?—Most certainly it is.

2543. Another point is that you say that in cleared areas you quickly replant a felling area to a certain extent, whenever opportunity arises. Do you consider it not only advisable, but practicable, to replant quickly?—I think the quicker the better.

2544. We have had different evidence on that subject, and I am glad to hear you say that?—The great object is to conserve the fertility of the soil, and that is a great difficulty in all our Welsh plantations.

2545. You do not wish the soil to lie for a number of years exposed to all the atmospheric influences?—No, and in many Welsh plantations you will not find they have an adequate crop on the ground.

2546. The producing capacity of the soil decreases if you let it lie unoccupied?—Most certainly it does.

2547. You also say that you are of opinion that people who practise forestry, so far as your experience goes, seem to have less technical knowledge of their subject than those engaged in any other profession?—Yes, I think so, so far as my experience goes.

2548. So that we are behindhand in forestry?—Very much so.

2549. I think you say in your memorandum that what is of special importance is that estate managers should have the opportunity of becoming acquainted with the correct principle of treating forests. I cannot put my hand upon the quotation at the present moment, but I think that is what you say?—I think it is a remark of mine. I do think it would be very desirable. Even people in my position—I should have been only too glad to get the advantage of short courses in forestry.

2550. You were at the University of Cambridge, and afterwards you went to an agricultural college? Supposing there had been an opportunity, apart from your ordinary degree, of attending some sensible instruction in forestry, say a moderate-sized course of lectures combined with practical instruction on suitable areas in the vicinity, would you have been likely to avail yourself of that opportunity?—Yes, I think I should have. The difficulty is, both in this case and at the agricultural colleges one does not get enough practical work. The thing is all too theoretical. At that age, when at the University, one does not realise the importance of these things as one does in after life.

2551. When you were at the college had you some idea that you were going to devote yourself to that occupation?—I had.

2552. That being so, do you think that if an opportunity had been offered to you at Cambridge for attending a course of sensible length, with some practical illustrations in woods, you would have availed yourself of it?—Most certainly. I commenced a course in mechanics there with the same view. It was the nearest thing I could get that was likely to help me in my future profession.

2553. Do you think other gentlemen like you would do the same thing?—I do.

2554. Therefore, it would be a distinct improvement if education was given at the different universities?—I think so. The difficulty is, that there is no scope for practical illustration in those places.

2555. That would be the difficulty, but that might be got over in the course of time. Until we have such opportunities, gentlemen like you who go to the university can spare the time to go for a week or two weeks to the Continent, where practical instruction can be given?—That could be done.

2556. That would be part and parcel of the business until we had the necessary means of instruction in this country?—Yes.

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2557. But you are decidedly of opinion that it would be a very good thing for the country to have these means in our universities to instruct gentlemen who are either sons of landowners, or who propose to devote themselves to the higher class of estate agents' work?—I do think that, but those particular centres of our leading universities are as good as some others. I had in my mind Cirencester and Downton, where there are large forest centres at hand.

2558. We have them in our mind, too?—Yes, I should be only too glad to see some forest education anywhere.

2559. Supposing there is a high-class system of forest education, both at Oxford and Cambridge, where gentlemen of your position go, do not you think it could be done as well there as at agricultural colleges, if the necessary areas of instruction could be made available?—Undoubtedly. I do not think the situation of the place would make any difference to the quality of the learning you get. Perhaps at Oxford and Cambridge you would get it better, and they might have more money to devote.

2560. You spoke of spruce woods. Have you any spruce wood in Wales under your management, of any age?—There are very few pure spruce woods.

2561. They are mostly larch, I suppose?—Mostly larch, but what spruce we have got are growing remarkably well. I have a very great opinion of spruce myself.

2562. In a moist climate like Wales spruce ought to be a good crop?—Yes, and it is not only the soil, but the climate which seems to influence its development.

2563. A portion of the pit wood in Wales is spruce?—Yes, a portion; but larch is far and away the best, because it stands a far greater strain. I have seen larch in pit-props double like my elbows under the strain, whereas none of the other woods would stand that.

2564. Supposing that larch disease spread to such an extent that the production of larch in Wales was practically no longer possible, do you think the mines would, to a fair extent, use spruce if they could not get larch?—I think they would, a good deal of it goes in that way now, and the spruce is far better than the pinaster.

2565. That comes from Bordeaux and those places, does it not?—Yes. The point is that it is cheap, and comes cut in lengths ready to be put straight in. There is no further handling required.

2566. They bring it cheaply because they use it for ballast when coming for anthracite?—Yes.

2567. (*Mr. J. H. Lewis.*) Do you think that if the Board of Agriculture were to publish pamphlets or leaflets on the subject of afforesting it would be any advantage to foresters generally?—I think it would be very advantageous, and I think if one had a practical forest hand-book it would be a great advantage: something like Dr. Fream published a few years ago on behalf of the Royal Agricultural Society. I forget the title of that book, but I think it was called "The Elements of Agriculture." It is a practical book within the reach of everybody. Most of the forest literature in my experience is too abstruse for the ordinary observer to grasp. People have not time, unless they are going to make a special study of it, to go into these abstruse details. The literature in connection with forestry should be made more popular.

2568. I think it is your opinion that the future successful prospects of forestry turn on the recognition by proprietors of the importance of extending and conserving their woodlands, and that public means should be adopted to impress these upon them. What public means would you suggest?—I mean the issue of leaflets, and, if it were possible for the Government of the day to assist in another way, then they should do it in some form or other. But I do not think, so far as my experience goes, that landowners do realise the importance of it, and I believe that the many years during which their capital is tied up, and the risks it has to undergo during that period frightens them.

2569. But you think if it were possible for the State to undertake on a limited scale afforesting, as the State does not die, and can afford to wait for a return, there are areas of land, particularly in Wales, which might be profitably afforested by the State?—Most certainly. I should be very glad to see that done. I believe it would give a tremendous fillip to forestry generally if the State undertook some experiments of that sort. That would be one of the methods by which it would be brought home to local proprietors throughout the country.

2570. If there are difficulties in the way, it would be worth making a strong endeavour to overcome those difficulties, in order to obtain so desirable a result?—I think so.

2571. Up to what height do you find that afforesting pays?—We have very few plantations over 700 or 800 feet elevations.

2572. I thought you said you planted up to 1,500 feet?—No; I should have said that the lands under my management rise to an elevation of 1,500 feet; in those upland districts there are great bare cwms and valleys, which might be very well planted. But, of course, the valleys themselves do not reach that elevation.

2573. Do the railway companies in your district give preferential or differential rates to timber imported from abroad?—I do not know that they do exactly. In our part of the country we are entirely in the hands of the Great Western, and likely to be for all time I am afraid now. I do not know that they actually give preferential rates; I cannot speak from personal knowledge.

2574. Do you consider that the railway companies' rates are unduly high?—Yes, I consider they are.

2575. You are, of course, in the hands of one railway company, and, therefore, you cannot help yourselves so far as that is concerned?—No. They run up to the Midland districts to about 30s. to 35s. a ton of 40 cubic feet.

2576. Have you considered whether, by means of steam traction, it might be possible to overcome this difficulty by creating competition with the railway company?—I have often had that in my mind, but we have great difficulties to contend with with regard to the local authorities. The bridges are not very good, or some of the roads are not good, and then the County Councils and District Councils come on top of you for extraordinary traffic, and you do not know where you are.

2577. Do you find much difficulty with game in young plantations?—Not much. It is not a very heavily preserved country in the way of game in our parts. When you are first planting you sometimes have difficulty, but we do not suffer much from game.

2578. Comparing the parts of Wales with which you are familiar, with other parts of the country which you have seen, you would say that there are large areas which can be profitably afforested?—Most certainly. I think many of the farms on our estate would be far more profitable and far better under wood than they would under farming, because the rents are very small in many districts, and do not pay the cost of maintaining the buildings very often.

2579. (*Professor Campbell.*) In the summary of your evidence you say that the Land Improvement Companies might more fully advertise their loan systems. Have you any knowledge of the working of these loans?—Yes, I have a certain amount of knowledge. I act under the Board of Agriculture as inspector in connection with these loans.

2580. Are these loans of any advantage?—I think they are of great advantage to landowners situated in certain circumstances.

2581. Are they being taken advantage of?—They are for building in a small way, but not very great.

2582. I meant for forestry?—No, not for forestry. I have had no experience of that. People do not seem to be aware of it.

2583. Do you know a single case where a loan has been granted for forestry?—No. I have been their inspector for eleven years, and I have not had a single instance of an application for forestry purposes.

2584. There is another question which I am afraid is not a fair one to ask you. We have had the term "waste land" mentioned here several times, and I have not yet had any definition of that term. I see you make some reference in your statement to this class of soil, which leads me to think that you might be able to give me a definition of it?—What we generally term "waste land" in our part of the country is waste of the manor, that is, the unenclosed mountain land, of which in some instances private proprietors are lords of the manor, and in other cases the Crown. Such lands are invariably subject to pasturage rights of the

tenants whose farms adjoin. That is what we generally describe as waste land.

2585. You do not mean lands of very poor quality, necessarily?—No, but there is a very great deal of that kind of soil—in fact many of our farms are of very poor quality, and would pay far better under arboriculture than agriculture.

2586. (*Mr. Stafford Howard.*) Does your experience go to show that there is an increase in forestry among landowners?—I am afraid it does not.

2587. Not in your part of the country?—No. People are doing nothing but cutting all the time, and very little or no replanting.

2588. You are very strongly of opinion that it is high time some steps should be taken by the Government or otherwise to call attention to the subject?—I am very strongly of that opinion. There is a great deal of cutting of these old oak woods especially and they are merely left to grow up from the old stools.

2589. Would you like to see a law that if a man cuts down so much he is bound to plant so much in its place?—It would be rather an arbitrary one, but personally I should like to see it.

2590. You say in your statement that in Wales in particular there is great mismanagement, and an enormous unproductive area, which could profitably be planted and largely increase the value of its resources, and greatly improve the surrounding land by shelter. You have, I think, something like 80,000 acres under your charge, and a good deal of that would come under that description, would it not?—A good deal of it.

2591. Are you doing something on the estates you manage to carry out your views?—I am as far as possible, but there is really so much to do that it is difficult to get through with it, and the state of the labour market makes it impossible to extend the forestry operations as I should like to. But I have seen many instances of the value of shelter on the mountain for sheep walks by planting. One cannot get labour for love or money at all. The ordinary labourer will not come under 4s. a day in some parts, and is very little good at that.

2592. With regard to the land which you manage, I suppose in the case of these waste lands you have just described the lord of the manor and the owner of the adjoining farms is the same person in some cases?—In some cases.

2593. And those are the cases where it would be easiest to carry out any such scheme, where you have one owner of the soil throughout?—That would be so.

2594. Where you have two owners, difficulties would be sure to arise?—Yes.

2595. Even if you had the case of one owner, if you plant any considerable portion of one of these wastes over which the adjoining farms have grazing rights, you are bound to interfere with the grazing rights of some particular farm?—Under other proprietors?

2596. No, of your own?—Yes, you are.

2597. Assuming you have a mountain and all the land around belonging to the same proprietor, if that proprietor wants to plant a considerable area of that mountain, he must interfere with the grazing rights of some of the farms, for the reason that the sheep of the farms go on certain parts of the mountain?—That is so.

2598. Therefore, you take away not a certain proportion from each tenant, but, practically, the portion of one or two particular farms?—That is so. There are no boundaries, but the sheep along these particular farms are in the habit of occupying certain portions of the waste.

2599. You said just now in answer to a question that if these plantations were made, the tenants would gain in shelter what they might lose in area; but some of them would gain in shelter, whilst the others might lose in area?—They would lose the particular areas on which they pasture their sheep at present.

2600. It would not operate fairly between the different tenants?—It might not.

2601. You would have to be guided in selecting your area by what would be suitable for planting?—Yes.

2602. You would not be guided by the object of only taking a certain proportion from each tenant?—No.

2603. Then there would be a difficulty?—It would be a difficulty, and there would be hardships; but, in my opinion, the financial results generally would be far greater.

2604. Supposing a farm came into hand, and was to let, if you took that farm in hand you might then plant the sheep-walk?—You could, with the general consent of the homage of the manor.

2605. Even if the whole property belongs to the same owner?—In that case there would be no difficulty.

2606. When a farm falls in, and is to let, then you might deal with it?—Yes, I think the lord of the manor has legal rights to enclose a certain portion of the manor as long as he does not interfere with the rights of the homagers.

2607. That possibly involves a legal question, and it may be a law suit?—There are legal difficulties, no doubt.

2608. But still, if those difficulties could be surmounted, you think it is a thing very desirable to be done?—Yes.

2609. And so far as you have the opportunity, you are trying to do it on the estates under your management?—Yes, and in these waste manors there are great portions not suitable for pasturage at all, which would grow trees very well. Some of these deep valleys and cwms are practically not pasture at all, whereas in many cases they would grow timber very well.

2610. You said that your idea of forestry instruction would be rather in connection with an agricultural college?—I think so.

2611. Better than Oxford and Cambridge?—I think so.

2612. When were you at Downton, was there any special forestry instruction there?—No.

2613. It has been established, as I understand, since then, as they have it now?—I do not know whether they have. There were certain lectures bordering on forestry education, such as surveying and things of that kind, but no forestry education.

2614. How many years ago was that?—That was in 1884.

2615. It would be a great advantage to these colleges if they could have an area set apart for their special instruction?—Yes, it would be. If the Forest of Dean was near the college, and the New Forest near another college, it would be a very great advantage.

2616. Would it not be of still greater advantage if those who gave instruction to the forester had the management of the instructional area, as well as the opportunity of going over a larger area planted by some one else?—No doubt it would be, if it could be done.

2617. (*Chairman.*) I see that Professor Wrightson in 1887 said that forestry lectures were delivered at Downton, by Mr. Curtis, and Professor Fream also assisted in teaching botany. There was nothing of that kind when you were there?—Yes, Professor Curtis used to lecture there in my days on estate management, and there was a certain amount of elementary botany, physiology, and subjects of that character given, but not in special relation to forestry at all.

2618. They had apparently a very full syllabus of forestry in 1887, but that was after you were there?—Yes, I had no practical results from my training there in that particular line.

2619. Is all the rough ground in Wales practically held under these grazing rights, so that you cannot get at it for planting?—Practically, that is to say, what we call the waste of the manor, the open land. There is a great deal of rough land on the enclosed land, which might be very well planted, but, of course, you could not have a large forest scheme there like you could on the open wastes.

2620. All the large areas are held under these grazing rights?—Yes, practically, in my country.

2621. Have you had any case of claims for extraordinary traffic brought under your notice?—Many.

2622. Are they generally given?—Yes, they are invariably given. It leads to a great deal of quarrelling. I have seen some extraordinary claims put in by district councils against proprietors who have cut timber and carried it away.

2623. Do you think they are commonly excessive?—I think they are; it is a thing very difficult to gauge, and I am always very careful in my arrangement with buyers now.

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2624. Do you think that the land-agent or the forester should be mainly responsible for the condition of the wood-lands?—I think it is a double responsibility. Of course, the landowner looks to his agent, and the agent really looks for the details to his foresters.

2625. When you come to the ground floor, the forester is responsible?—Yes, but the agent is the man who is responsible to the landlord.

2626. He, I suppose, has not very much time to give to forestry?—That is the difficulty. The agent has to be everybody and do everything.

2627. And that makes the head forester an important person?—Yes, it does.

2628. You think there is a great deal of land under farms which does not pay a rent equal to the interest on the fixtures, that is, the buildings, the drainage, the fencing, etc?—Yes. Our farms in Wales are very small, they average somewhere about 60 acres, and they are rented at about 10s. to 12s. an acre. Every farm requires its dwelling-houses, its cowhouses, stables, barns, pigstyes, etc., and you cannot do it, with the present price of labour and materials, under £700 or £800.

2629. What is the rent you think it is profitable to have under agriculture in Wales?—I would not plant land for which you could get over 10s. an acre.

Mr. A. Pitcaithley.

Mr. ALEXANDER PITCAITHLEY, Forester, Scone, Perthshire, called; and Examined.

2630. (*Chairman.*) You are Forester at Scone?—Yes.

2631. You think that it is impossible to give any perfectly accurate results of growing timber?—There has been no record kept, as far as I am aware, anywhere.

2632. And you think those records are very necessary?—It is very necessary to have an accurate idea.

2633. But in spite of the want of records you think there is sufficient evidence to show that timber growing in many cases has paid very well?—There is abundant evidence everywhere.

2634. And you give two illustrations from Scone?—Yes.

2635. Is it within your knowledge that in other properties very good returns have been made from land which was comparatively valueless for any other purpose?—Yes.

2636. These examples you give, however, are unusually good ones?—Yes. I may say that the management in Scone has been an exception, too. Forests in Scone generally have been always under comparatively good management compared with some other estates.

2637. The soil is good for trees?—Of course, but the soils are variable. The mixed plantations of hardwoods are on very good soil.

2638. Is there any evidence to show whether these trees have been protected from ground game in their youth?—I do not think at that time the ground game was a nuisance in Scotland. I think that rabbits hardly existed 90 years ago.

2639. You can hardly say that now?—No. There were none in Scone anyhow 90 years ago.

2640. But with very few exceptions, you would say that all over the country woods are bad?—Miserable.

2641. To what cause do you mainly attribute the condition of the woods?—Bad management, or the want of knowledge of good management. That is the main reason, but there are other reasons. About 30 or 40 years ago a better price was given for pit props than is given now, and that induced many people who needed money to realise as much of their woods as possible, and, in the absence of advice from managers, it was done, with the result that they were doing damage when they thought they were doing right. That was an inducement to overthin. I am not referring to Scone just now, but to my experience on other estates.

2642. I suppose also that in many wood districts of the country, where the land is occupied by agriculture, and yet peculiarly suited to the growth of timber, the proprietors are very often in the least favourable position to find money to plant—that is, over a great part of the Highland area the proprietors have less resources and the greatest amount of suitable land to cultivate?—That is so.

2643. You do not think the timber area will increase very rapidly if it is left to the resources of the proprietors?—It occurs to me that before we increase our area we ought first to properly manage the areas we have. There are great areas in the Highlands and other parts of Scotland nominally under a crop of trees, and we do not want at once to acquire further land until we do something with the land we have already got. It occurs to me there is a great deal to be done on areas which are nominally now under wood.

2644. And, therefore, you attach great importance to an instruction college?—That is the first step, I think.

2645. That is the most necessary thing of all?—To begin with.

2646. More necessary even than theoretical training?—Yes; I think it must go hand in hand. Practical training is not of much use without the theoretical, neither is the theoretical without the practical.

2647. What is your view of the best method by which the two can go together? Would you have a Forest School?—A Forest School is very necessary, but whether the theoretical training should come first I do not know. I think the practical training is the first thing we should try and get. There are other things besides growing trees that a forester requires to know. In dealing with private owners' land, there are other things, such as the general management of the estate. He must have a thorough understanding of his position or future position as a forester on the estate before he gets stuffed up with theoretical ideas. He is very apt to have something to do with the management.

2648. If you wished to train a young forester for a head forester now, you would begin with him as a boy, under a forester on a well-managed estate?—Yes, as a lad. Boys are not much use. Until a young man's opinions are formed, he does not know what he desires. Many boys do not know what they intend to do. I think a man must have his mind made up as to his profession. They must be taken very young.

2649. When he was competent to do his best in an instruction forest you would send him there for a time?—Yes, to a course of theoretical training.

2650. Then I suppose he would have to earn enough to keep himself in food and clothes?—Yes, that is my idea. I have not given the thing any great thought, and I have no means of knowing what would be the most suitable way of working out the theory. I only know that such instruction is entirely necessary. I speak from experience; I know the want of it myself. I had no theoretical training, and I have felt the want of it.

2651. Have you not got some young men at Scone now?—We have adopted that plan. Lord Mansfield has arranged that when I take a young man on, I do so on the understanding that he is to stay three years before he leaves. He can leave at any time, but I tell him he must not expect assistance if he does leave, and I find it works very well. The young man, knowing that he is thought of and looked after, comes to Scone. During the time that there has been a complaint as to want of labour, I have had no difficulty in getting young men. They are always willing to come, and want to come.

2652. And they wish, as a rule, to get an education there?—Yes, that is their idea.

2653. Are they well enough educated to become head foresters?—The majority of them, I think. They are a superior class of young men that I get.

2654. Do they take every advantage of any instruction that is given to them?—Yes, they appeal for it.

2655. And any experimental area or instruction forests should have demonstrations in the growth of timber, in its manufacture, and transport, and in all the departments of the forestry business?—Yes.

2656. Do you think a head forester should be able to work up his own timber?—He ought to have the ability of doing so. It is not always necessary, possibly. In certain districts, where there is keen competition—such as where we are situated—I think it is not necessary to go to the expense of plant to work up the timber. We get the full value of our timber by selling to the timber merchant, and I think in our case it does very well.

2657. Are you responsible for the woods at Scone?—Yes.

2658. Have you any method of working them, or do you just make a report year by year what you intend to do?—I make up an estimate from year to year, the proposals for work done during the year, and report on the work done for the previous year, and the cost. I keep a record of it all.

2659. I see you think it would be a great advantage to wood-lands if warrens were formed?—That is our greatest grievance, the rabbits.

2660. What is the wood-land area at Scone?—Nominally, about 7,000 acres, but they are not all fully cropped.

2661. Under good management you think that land making less than 10s. an acre would do better under wood?—Certainly, if it is suitable for a timber crop.

2662. You would acknowledge that there is a great deal of land which pays very well at present, grouse rents, and you say yourself you think you have enough to do for some time to come in making the existing wood-land perfect?—That is my idea.

2663. Is Perthshire a good centre for a Forest School?—I should think it is the best for Scotland, for it is the most convenient.

2664. Are many foresters trained in Perthshire?—I think the majority come from Perthshire. The English foresters mostly all come from Perthshire too.

2665. There are a very large number of foresters bred there?—Yes. And they go to all parts of Britain.

2666. And you think that foresters, as a class, are fully capable of taking advantage of instruction, and fully alive to the deficiencies of the training that they receive at present?—The majority are. There are a few who do not think so.

2667. Do you think they would profit by any facilities?—Undoubtedly.

2668. Do you think there is any revival of interest amongst factors and landowners in forestry generally, or do you think things remain as they were?—I am afraid they are very much as they were. At least I cannot say I have observed, except in certain districts, any great improvements.

2669. (*Professor Campbell.*) How many men do you employ on the 7,000 acres?—I have also the general estate work to supervise, and my men are not altogether employed in the forest. They do other estate work as well, fencing and draining. Therefore, I could not give you the number.

2670. (*Mr. J. H. Lewis.*) We have had it in evidence that in regard to the land in England and Wales, which might be perhaps profitably afforested, difficulties have arisen owing to grazing rights which the owners possess on those lands. Could you tell us to what extent that difficulty would be an obstacle in Scotland?—I do not think it would be felt. I cannot speak authoritatively, but that is my opinion.

2671. Those rights do not exist in Scotland to the same extent that they do in this country?—Not to the same extent.

2671*. (*Professor Campbell.*) They are sheep farms?—Yes, and are let on lease mostly.

2672. (*Professor Schlich.*) You said in your evidence that one of the reasons why a good many of the woods in Scotland are in an unsatisfactory condition now, has been brought about by the fact that at some previous time they cut out the best trees for pit props to make money. Do I understand you correctly?—That is quite right. I have done it myself.

2673. And you are also of opinion that with proper skill and knowledge in those who have the selection of the crop for certain particular soils and situations, and for the future management of the woods, the ultimate profits would be considerably greater. You also say in your statement that you now find, with very few exceptions, all over the country gappy woods, stunted growth, and short coarse stems standing far apart. For these reasons, you think it essential that greater facilities should be given for education in forestry?—Yes. There are scarcely any facilities in outlying districts. I should say it is essential to give facilities without saying "greater" facilities.

2674. If at a previous period proper facilities had been given, you think this state of affairs would probably not have come about?—Certainly not, or they ought not to, anyhow.

2675. In other words, you recognise the full importance of adequate means of acquiring forestry education?—Yes.

2676. You have yourself now obtained one of the prominent positions amongst Scotch foresters or wood managers; but, I suppose, it has taken you a great many years to arrive there?—Rather!

2677. How many years?—About 25.

2678. If you had had in your youth opportunities freely available for studying a combination of theoretical and practical instruction in forestry, do you think you might have sooner arrived?—A man is better for having had experience in other things besides forestry before he gets a place of trust. He may have the ability, but I do not know that he could exercise the duties of a trust without being well tried in this world first. I do not believe in putting young lads, even with all their knowledge, into places of trust.

2679. I do not want to put a young lad into your place, but I mean to say that the knowledge of forest management which you now possess has taken you a great many years to acquire?—Certainly, and it is not all acquired yet.

2680. Might you not have acquired the same knowledge in a very much shorter time, if you had had proper means of instruction at the beginning?—That is so.

2681. And you also think that improved forestry instruction is required in order to improve the existing foresters?—Yes.

2682. And when you have done that, the extension of forests will come of itself?—Yes.

2683. You will see it by the results?—Yes. Any information we do possess has been only acquired during recent years, and has been mainly due to men like yourself or other writers, who have put the facts before us. In my young days we had nothing to read; there was no literature, and, certainly, no place that we could go to to get an example or see what things should be done. Things are a little altered. The Scottish Arboricultural Society has taught us a great deal.

2684. Did you go to the Continent with that society?—No, I had not the pleasure.

2685. Do you think a young man or a young lad ought to begin practically under a competent manager like yourself?—I think so.

2686. That is the best plan?—Yes.

2687. And then should come further study when he has had some acquaintance with the practical work?—That is so.

2688. (*Colonel Bailey.*) I notice in your memorandum (*Appendix XI.*) that in respect of the general ignorance prevailing, you specify certain matters, for instance, that the forester who has not had any special training does not know the extent of draining necessary, nor the species to grow on various soils, nor at what distances to plant; and he is not even always reliable in valuing timber; he does not understand anything about under planting, nor about the diseases and pests which forests suffer from. Do you find this state of ignorance pretty general?—Yes. It is general everywhere.

2689. And it is due to the fact that there have been no means of acquiring information?—There have been none whatever.

2690. You ascribe some of the very light crops of trees you have on the Scone estate, to the treatment they received?—Yes.

2691. You say it is entirely due to neglect of the plantation?—I have a report on the plantation 80 years ago, and it says that the wood was destroyed for the want of thinning and proper management.

2692. Was it not a fairly common expression a few years ago to speak of any plantation that had not been thinned as having been neglected?—That was so.

2693. When a man said his plantations were neglected, he meant that they had not been thinned?—That they had not been destroyed.

2694. With regard to the cutting down of immature woods when a good price was offered, that is probably largely due to the want of any scheme of management?—It was due entirely to lack of money

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2695. Do you think the cutting of young woods for pitprops might have been avoided, if there had been a scheme of management?—Yes, I think it might.

2696. I mean if there had been a scheme laying down what the cuttings ought to be at different periods, a scheme of management showing that in each year certain fellings were justified and proper?—It also meant that those who had the management might be ignorant that they were doing any harm to the woods. I mentioned that case to illustrate that I, as a forester, was never questioned as to the necessity of thinning.

2697. (*Professor Schlich.*) There is a well-known highly-placed German forester, the late director of the forest school at Minden, who does it at the present moment, who says that at a certain age you must cut down the best trees. The rest of the German foresters think he is mad?—We have plenty of foresters in Scotland who still advocate the Scotch system.

2698. (*Colonel Bailey.*) It has been suggested that a State area might be obtained for purposes of instruction. Do you think that would also act usefully in informing landed proprietors as to the profits that might be derived from their wood land?—Certainly.

2699. If they could see an object-lesson before them, how the timber could be grown on certain soils and in certain climates, and grown profitably, would this not have a good effect in inducing them to take more interest and care, and spend more money on their woods?—That is the principal effect an experimental forest would have.

2700. Is it not within your knowledge that a great many foresters at the present day hold very diverse views as to the applicability of what we have come to call the Continental systems to our own country?—They are all at sixes and sevens.

2701. Many men say that these systems may be all very well in Germany and France, but they are wholly inapplicable to our country?—Yes.

2702. You say in your statement that there is no chance of settling the disputes and discussions about the application of Continental principles to this country, and no models to which foresters can shape their management?—That is so.

2703. I see you wind up your note by saying that "Under our system we have produced an article of inferior quality that can only be used for certain purposes as a third or fourth rate timber, when, under other treatment, it might excel any foreign timber, and certainly could be produced in greater bulk on less ground than that on which we grow our inferior timber." Do you feel satisfied that we could grow as good timber on our own land as can be imported into the country, if we went the right way about it?—We could grow a better timber than is at present imported. A poorer quality of timber is now imported than formerly.

2704. (*Sir John Rolleston.*) You think there is a good deal of land that would grow timber better than corn or mutton?—Much.

2705. Was it you who said that land which would only make 10s. an acre or less would be better growing timber?—I believe there is plenty of land drawing over 10s., but I should make 10s. a limit. I believe plenty of land drawing over that would be better planted when there is much building and fencing to do.

2706. (*Mr. Marshall.*) I think you mentioned that you would rather advise people to improve some of the badly managed existing woods than go in for planting larger areas?—I mean to improve existing woods as a first step, to be followed later on by other things. If we could show that our woods are better the other would follow as a consequence.

2707. How would you do it—by acquiring certain areas and planting them in the same way? Would you plant young trees amongst old ones?—I do not believe in mixed planting, or rather, underplanting.

2708-9. Would you go in for natural regeneration at all?—With ground game it is impossible.

2710. Do you know the Blackwood at Rannoch?—I have been there.

2711. That is a very badly managed wood?—It is not managed at all.

2712. There are a few very fine specimens of Scotch fir there?—Yes, where the wood was originally dense they are very good.

2713. There is a certain amount of natural regeneration going on there, and there is rather a dense growth of young fir trees coming along in places; have you noticed that?—No; I have not seen anything good there.

2714. I would not for a moment say it is good. We had it in evidence yesterday that most of the young foresters, inexperienced foresters, in Scotland, could be trusted to measure standing timber to get at the cubical contents. Have you found they could be trusted to do that?—Not in my experience. In fact, there are comparatively few old foresters who can be trusted to measure standing timber.

2715. That is what I thought, but we had it given in evidence that it was a common thing for the foresters to value it?—It is done, but I do not know that it is done properly.

2716. You would not say that they measure standing timber accurately?—I do not think they do.

2717. Then you were saying it would not be necessary for young foresters to be instructed in the conversion of timber very much because you thought it was better to sell the timber to the middleman and let it be carried away?—Not always, but in some cases.

2718. In Scone itself do you keep any sawmills?—Yes, for estate purposes.

2719. It would be necessary, then, that the young foresters who were coming along now should know something about that part of it?—Yes. Certainly. Because they may ultimately land in a place where it will be necessary to manufacture timber, and they must have the ability to take that duty upon themselves if required.

2720. (*Chairman.*) I suppose it will be still more rare to get the foresters to tell you what the cubical contents of a certain area of wood is, or whether the amount of wood on the ground is excessive or deficient?—Experience is our only guide now.

2721. But the number of men who can do that is small?—Yes, that is my experience.

2722. Then you say you do not believe in mixed plantations. Is that because they are much more difficult to grow and require much more experience?—The reason I do not believe in them is that I have not yet been persuaded. I have not seen anything to persuade me that it would be judicious. I am referring to the underplanting of these plantations. When a plantation gets to be over-thinned, I think it is best to clear it out.

2723. I mean by mixed plantations different varieties that happen to grow well together—mixed trees in a plantation. You may have several varieties of trees growing together in the same piece of ground. Would you object to that system?—Certainly not. It is sometimes necessary, but to what extent we do not know.

2724. We have had it in evidence that coniferous wood is what there is the greatest shortage of. Do you find coniferous woods do very well in your country?—Excellently.

2725. If woods could be mortgaged, and a regular system of felling formed part of the schedule to the deed of borrowing, it would be impossible in that case to cut woods before the time at which it was arranged to do it?—It would.

2726. If you could mortgage the growing timber, and you had a plan of regular fellings attached to the deed or mortgage, you think that would get over the difficulty?—Yes.

Mr J. H. Croxford.

Mr. JOHN H. CROXFORD (Messrs. Price, Walker, and Company, Limited, Timber Merchants, Gloucester), called; and Examined.

2727. (*Chairman.*) You are a member of a large firm of timber merchants in the West of England?—Yes.

2728. No doubt you find your west country is very favourable for the growth of trees?—I am very little in touch with English timber, but, of course, in Gloucestershire there is a comparatively large area of English timber grown.

2729. You chiefly import?—We import very largely.

2730. Do you find that for most purposes foreign grown timber is better suited for your needs than the home grown?—English timber cannot compete in quality or in price with the great bulk of the wood used in building construction in this country.

2731. You will agree, as we have already had it in evidence, that for some purposes, where you want exceptional durability in the timber, the British is better than the foreign?—English oak is far superior to any foreign oak, and the same may be said of ash, beech, and elm.

2732. But, as you say, none of these are grown in sufficient quantity to supply the needs of the home market?—No, it is impossible.

2733. Do you think the irregularity of the supply of British timber depreciates its value?—I do not handle English timber. I handle foreign timber, and at no time have I found, for many purposes, that English timber, as at present produced, can compete in price against foreign.

2734. You fear, do you not, that there may be a falling off in the supply of foreign timber?—The day will come within a reasonable time when foreign timber of some classes will get more expensive than English timber.

2735. Do you find any falling off in the quality of foreign timber?—No. There is some class of foreign wood that is getting more expensive every year, costing more for production. Thus, I think for many purposes English timber will supplant foreign, and also that English oak, ash, and elm will be used, seeing that it will compete in price within a reasonable time.

2736. Is there any falling off in the home demand for timber?—No, it is greater than ever.

2737. Is the price gradually rising?—The price of foreign timber is gradually rising.

2738. But you get every kind of it with facility?—Yes, readily. I heard you gentlemen talking about English larch and spruce being a cheap timber. I can import Canadian spruce cut to sizes for 1s. a cubic foot, and there is no English timber at the present moment that can compete with it. One very great bar to English timber, larch, Scotch, and so on, for pitwood is the heavy railway carriage. You asked the last witness how it compared. Our foreign timber is carried at very much smaller rates than English timber. It is handled easier. But apart from that, the railway carriage from the port inland is very much less than from one place to another for English timber.

2739 Do you import the bulk of your timber in the round?—No; when it is in the log timber it is dressed.

2740. Have you mills of your own?—We have.

2741. Do you think our English mills are as a rule up-to-date?—We think so. They are being improved to keep up with the times.

2742. Is all the latest labour-saving machinery being used?—Yes.

2743. And is the practice of bringing in manufactured wood increasing as compared with bringing in timber in the round?—Yes.

2744. But you think it will be possible to have a great extension of the home timber supply if it is properly managed?—Undoubtedly, more especially with slow growing woods.

2745. Do you import larch?—No, but we import timber that competes with larch; for instance, the Canadian spruce, which is far cheaper than larch. Larch is used for pit-wood chiefly, fencing, and that class of work. We import spruce as against larch for fencing and such things, Norwegian and French pit-wood, a small Swedish timber roughly dressed, cut to lengths, as against larch grown here. Unless larch is near a colliery, larch cannot go against imported stuff.

2746. Have the two been tested together?—I am speaking about cost.

2747. Do you think that the purchasers in this country understand the value of wood?—They do not mind that. It is the question of cost in these times.

2748. Is it purely a question of cost?—It is purely a question of cost.

2749. Do not they take into the question the durability or seasoning?—Not at all.

2750. Do you think that most of the wood that is used in this country is properly seasoned, the home and the foreign?—A great deal of it; but, of course, with foreign wood a great deal of it is artificially seasoned. We have a large drying plant.

2751. (*Mr. Marshall.*) I should like to ask about these railroads. We have already had some evidence with regard to it. Is it a fact that the rate for foreign timber from Gloucester to Birmingham is only 6s. per ton, 66 feet to the ton?—That is right.

2752. Whereas the price of English round timber, 40 to 50 feet to the ton is 11s.?—I think that is so.

2753. How do you account for the railway company giving such enormous preference to the foreign import? Foreign timber can be put on the trucks alongside the wharf with light terminal charges. The timber is put up in train loads and taken away to its destination, whereas the English has to come to the station, and there are heavy terminal charges. A few trucks are only picked up at each station at one time and another.

2754. It is more easily loaded, that is to say, of a better shape and size to get on to a truck?—Yes, and the terminal charges are very considerably less.

2755. We have had it in evidence that the quality of foreign timber that comes into this country is not as good as it used to be; in fact, we are told that some special sort of deals were almost unprocurable. Has that been your experience?—There is much less of Ottawa pine deals, certainly?—but I have never seen the time that they could not be obtained at a price.

2756. The price of the best quality of foreign stuff has gone up considerably?—Yes, of all sorts.

2757. Have you visited any of these forests at all where pit-wood comes from?—I have not.

2758. Is it all young wood?—Yes.

2759. This enormous quantity being drawn from these woods must more or less damage the future timber supplies?—Yes.

2760. (*Professor Schlich.*) What kind of timber do you import cheifly? — We import chiefly Norwegian, Swedish, Finnish, Russian, Canadian, and from the Southern States of America.

2761. Do you import large timber or pit-timber chiefly?—We import neither, but I am closely connected with people who do. We import spruce. There is not enough in pit-timber.

2762. Is it imported squared?—French timber is round, cut into lengths ready to put into the pits. Norwegian is dressed, roughly squared, and cut to longish lengths.

2763. Those are all pieces of timber of comparatively small dimensions?—Yes. What we should call all sizes.

2764. Do you import timber of larger sizes for planks?—Yes. We import both timbers and deals, boards, match boards, and all those things. They are all dressed.

2765. Do you get some of the larger size timbers from the country round the Baltic, Norway, Russia, Sweden?—We import Swedish timber, but the great import from the Baltic is converted timber, deals and boards.

2766. How many years have you been at the work?—Since I left school, 34 or 35 years ago.

2767. I was going to ask you whether you had noticed that there has been a falling off in the dimensions of these big logs?—I have not. I think that the reason of the cost being gradually enhanced is that much of the timber is being cut further away now from the ports.

2768. You have not noticed any particular falling off in the size of the log?—I have not.

2769. Do you sometimes get white pine from Canada?—Yes.

2770. It has been officially stated that the dimensions of the logs exported from Canada have considerably fallen off in diameter?—I think that is correct.

2771. There is a considerable falling off in the size of the logs of white pine?—Yes, I do not think the word considerable should be used—there has been a falling off, but not to any very great extent.

2772. (*Colonel Bailey.*) I should like to make a remark in this connection. Three or four years ago I passed through a good part of Canada, and went into a great many forests in which they were cutting the

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white pine. I was in the company of people who knew all about the past history of these woods, and I saw the whole thing in actual operation. There is no doubt in my mind that woods had been passed through before, when timber of certain large sizes were cut out, which alone were then considered worth taking. Now there is a new development. There have been concessions or grants to timber merchants, who now go and take out the timber which was neglected by the former grantees, who did not find it worth their while to remove it?—That is so. But there is a great quantity of timber of large dimensions further afield.

2773. (*Chairman.*) You are quite satisfied with the manner in which the foreign producer, saw miller, or manufacturer, puts his goods upon the market here?—Yes.

2774. He does it well?—He does it very well.

2775. Do you think that he knows his business better than the home people?—That is my impression. My partner, who is a landowner in the neighbourhood of Gloucester, has been replanting, and he has stopped, for the reason that the local authorities have assessed his plantations, land which was not worth 2s. 6d. an acre before it was planted at 10s. an acre. That holds good through Gloucestershire. Land which he could not let at all is assessed at 10s. per acre, besides coming under the agricultural rates of 1s. 3d.

2776. (*Professor Schlich.*) Because he has planted it?—Yes, and spent money on it. Why I should be glad to see afforestation is that we locally get very short of labour in the summer time, and if large plantings were carried out, the labour that would be used in the winter and spring would be available for us in the towns in summer. Country labour is very cheap with us.

2777. So that in your partner's case the rates have actually stopped the extension of the area?—Yes.

2778. Have you ever heard of the tithe being heavy on land?—He has no tithe on the land. I do not know anything about the tithe.

2779. (*Mr. Marshall.*) They are not encouraging him at all?—No. He told me that they assessed him at 10s. an acre on land not worth 2s. 6d. an acre.

2780. (*Chairman.*) You think that although you can get all you want now, there is a possibility of a timber famine ahead, and we ought to be preparing for it?—Undoubtedly.

2781. Both in coniferous and hard wood alike?—Undoubtedly. I know a great many English timber merchants, and generally see a great many. There is a lot of felling going on, and very little planting, especially with the slower growth trees, ash, oak, elm, and beech. I am told that you cannot grow good timber from old stools.

FIFTH DAY.

Tuesday, 6th May, 1902.

PRESENT:

Mr. MUNRO-FERGUSON, M.P. (*Chairman*).

Sir JOHN F. ROLLESTON, M.P.
Mr. E. STAFFORD HOWARD, C.B.
Professor W. SCHLICH, C.I.E., F.R.S.
Colonel F. BAILEY, R.E.
Professor J. R. CAMPBELL.
Mr. J. H. LEWIS, M.P.
Mr. GEORGE MARSHALL.
Dr. WILLIAM SOMERVILLE.

Mr. REGINALD H. HOOKER, *Secretary*.

COLONEL BAILEY, recalled; and Examined.

Colonel Bailey.
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2782 (*Chairman.*) In the evidence that we have had it has been frequently recorded that there is an absence of figures or systems of accounts which would show whether woodlands really pay. Is there any difficulty in instituting a system of control books which will show the revenue and expenditure, and therefore prove what the land is actually giving under timber?—Such returns are commonly kept up for State forests in France and Germany, and doubtless in other countries. I consider such statements and accounts are absolutely necessary, not only in order that you may have a record of the expenses and receipts to show what the woods have actually earned for you, but also to keep the records of work done for the benefit of those who come after you, and who have to revise any plan under which you may be working; also for the further purpose of securing and showing the owner that the provisions of the working plan are being carried out, and that the cuttings prescribed in the plan are duly executed. This is a very important point, because if you have no control of cuttings there is no use whatever in laying down the plan. You must be able to see they are properly executed. Hence it is quite the usual thing in all organised woods to have such records.

2783. There has been a general concurrence of opinion in favour of regular systems of working woods by working plans, and you think that these control books are an essential feature of that system?—Essential.

2784. And it is almost the universal custom abroad?—So far as I am aware, it is a universal custom in all organised woods. It is the only way of maintaining the organisation.

2785. When you commenced to deal with forestry in this country did you find an absence of any system of keeping accounts?—I found no system existing; so that although one may get isolated statements of a certain value no doubt, it is impossible to get any accurate statements that can be relied upon to show fully what occurred in the past.

2786. You put a system of accounts into operation. Have you heard that there has been any difficulty, or have you found any difficulty in having it carried out?—I have not heard of any difficulty at all. On the other hand, I have heard it has been found quite easy. If you desire it I will explain what the system is. In a working plan I made some years ago I laid down the general scheme under a plan of management, and then I prescribed the location of the fellings, for a period of 20 years. The table shows the fellings of the first year, the second year, the third year, the fourth year, etc., down to the twentieth year; and it shows the areas in which these fellings were to take place. Then it was necessary that the proprietor of the estate should know whether this work was being done or not. Hence we adopted—I will not say devised, because the form is an old one—a form which shows in the first place the provisions of the working plan—that is to say, it gives an abstract of the prescriptions of the plan in regard to each year. You find under the plan, for instance, that in the fourth year, 1901-2, cuttings are to be made in five different blocks. It is the duty of the forester or of the factor to put this down in the first column of the form. At the end of the year he fills up another column which shows what was actually done. Then a comparison is made between the provisions of the plan and what was actually done, and you may get an excess or deficit of cutting. If you have not cut one of the perscribed areas it remains a deficit. If you have cut more than was prescribed that would appear as an ex-

cess. According to the principles on which we work in organised woods you are entitled in the next year, or any year you like, to take out any deficit of cuttings that may stand to your credit; but, on the other hand, if you have cut in excess, which you might possibly have had to do, that excess has to be adjusted as soon as possible by reduced fellings. The proprietor can see at any moment from an inspection of this book to what extent the provisions of the plan as regards cuttings have been carried out. He knows at any moment exactly how he stands. This plan prescribes the cuttings in detail for a period of 20 years, which is perhaps an unusually long one. There may be always a slight divergency from the prescription to suit convenience. Something might happen which would lead you to cut an area sooner than was laid down in the plan. For example, supposing you experienced a storm that blew down a portion of the crop, you might say, "If I do not take the rest next year it will be all blown down." That would lead you to modify the provisions of the plan. If you had to take one area before its time, you must take another later than its time, in order that you may not exceed on the one hand or cut too little on the other. This book clearly shows you how the matter stands. As regards the rest of the records, we have here a cash book of the kind that would be kept upon any estate, or, indeed, in any business, which simply shows the cash transactions from day to day. The cash transactions are ledgered out into another book, so that under each heading of work and for each forest you find exactly what has been done, what cash has been received, and what has been expended, and under what heads. Then we have we have a further form in the same volume which gives a summary of the whole work. It gives you in the first column, "Site and Description of Work," the result of the cuttings—that is the quantities of timber cut in each year, and a summary of all the other works performed, such as so many chains of fencing, so many chains of drains, etc.; and there are two columns at the end which show the money value of the produce disposed of, and the cost of the work; so that here, within the covers of this book, you can see in one moment that your cuttings are kept within the limits prescribed by the plan, and, on the other hand, you can see at a glance what the financial result of the work has been. A book like this is quite easily kept up, and a volume of this size would last a great many years. You have a complete record of the forests on the estate, and you can see exactly what the financial results of working have been.

2787. (*Mr. Stafford Howard.*) I should like just to have your ideas, which I understand you have formed pretty accurately, as to what is ideally desirable for the instruction forest in Scotland in connection with the work that is now being carried on in forestry instruction in Edinburgh. I should just like to know what you think is desirable from your point of view, if it could be got?—You refer, I understand, to an instruction forest, what Dr. Schlich has called a school forest?

2788. Yes, exactly so, or a State model forest, if you like?—I have explained that in the memorandum which I read at the beginning of my evidence, but I shall have great pleasure in repeating it. I am quite sure that it is wholly impossible to carry on instruction in forestry without an area for the practical illustration of what you teach. That is an absolute impossibility; you cannot do it. There are some things, no doubt, you can teach in part to students by word of mouth or diagram, but most of the instruction cannot be given effectively in that way. You cannot possibly give students any sort of idea on the subject of thinnings, for example. You might lecture them for session after session, and then send them into a wood to carry out the work, and I am quite certain they would not have the slightest idea how to begin it. Such teaching must be practically demonstrated, and consequently all teaching of forestry without an area for practical instruction is ineffectual. Therefore I affirm that we must have an area for practical instruction. But I must go a step further. That area must be properly managed. It is little use taking students to teach them sylviculture in a wood in which sylviculture is not properly carried out. One may take a class to a wood and say, this thinning has been done wrongly; the stock is much too thin, or this or that error has been made. That may be of some use, but still it does not tell them how the work ought to have been done.

2789. What sort of area do you think would be necessary?—I feel a considerable difficulty in stating an area, because this would so much depend upon the conditions of the ground. If it could show varied conditions of low ground, high ground, and so on, then its area should be larger than if it could illustrate one particular kind of work only. I think the ideal thing would be to have a large area with very varied conditions within it. I should say, speaking generally, perhaps we ought to have areas of 1,000 to 1,500 acres.

2790. That would be sufficient to occupy the time?—I should think it would. I would like then to have an instruction forest or school forest, of somewhere about that area, more if we could get it, sufficiently near to Edinburgh to enable the students to go there and back in the day, so that they could make a day's excursion, starting as early as you like in the morning, and coming back at night. I do not think it is necessary that the forest need be within half an hour or an hour of the town, but it should be sufficiently near to enable the class to go there and back in a day.

2791. Is it your idea that the forest should be under the management of the instructor in Edinburgh with a local forester on the spot to carry out the practical work? That the direction of the whole should be in the hands of the Forestry School in Edinburgh?—It is most desirable that the professor or lecturer in Edinburgh should have control over the work. I have seen school forests attached to several continental forest schools, and in all the cases I know the director of the school has complete control over them. That is done to prevent clashing, and to make sure that all work in the woods is done not only in the most economic and best way from the professional point of view, but also that the woods are made as useful as possible for the purpose of instruction. It is within my own experience that friction may otherwise arise, because the professor of forestry at the forest school would take his students to criticise the work of someone else. He is bound to tell the students where the work is well done or badly done, and criticise it. If he goes to woods which are under some other management than his own, and over which he has no control, that is very apt to lead to friction, and I believe that the only way in which this can be entirely avoided and the work done in the most convenient way for the purpose of instruction is to allow the head of the forest school to have control; he must have a thoroughly qualified man in the forest, who can carry out the work, but he must tell the man in charge what he wants to show, and ask him to undertake such and such works for the purpose of illustrating the class work.

2792. You would say, I suppose, that such a forest ought to be managed not merely for the sake of instruction, but also to pay financially?—It might be managed very well to pay financially. If it could not be managed to pay financially it would not be a forest of instruction. That is the first condition I would put down, that it is to be managed essentially for profit. One of the essentials is that it should show a good financial result. I would go so far as to say that if it was not managed in that way it would be of no use at all for practical instruction in economic forestry.

2793. The selection of such an area would require considerable care?—No doubt.

2794. But you think such an area might be acquired?—I think so.

2795. There are areas available which might be suitable?—I cannot speak at the present moment as to any particular area, but from what I have heard, I think that suitable areas might be found.

2796. (*Professor Campbell.*) You are distinctly of opinion that this model forest should be worked to be a commercial success?—Absolutely so.

2797. And that at the same time it would be perfectly suitable as a demonstration?—Yes. I repeat, if it were not managed on commercial principles it would not be a suitable demonstration forest.

2798. You could not demonstrate methods that are to be avoided or the growth of trees which might not be particularly suited for the district, and yet it would be necessary to show your students the cultivation of such trees?—If you want to show them that, there is no difficulty in finding it round about, and this will be so for some time to come. I do not think it would be necessary to make provision to show bad work. A school forest or instruction forest would certainly em-

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brace an area for experiments. That would be a legitimate part of the working of the forest as a financial concern, because you want to do the very best that you can, and to do it a certain amount of experiment is necessary.

2799. In your replies, have you been keeping the idea of the forest school quite distinct from the model forest?—No, it is one and the same thing. My idea is that if you have a forest primarily for educational purposes, worked on a financial basis entirely, it would also act as an object lesson to proprietors and foresters and others interested in the business, who would come to see it, and to learn what it was possible to do under certain systems of management on our soil and in our climate.

2800. But what if that soil was not suitable to the kind of tree you wanted to grow?—That would point to having more than one area.

2801. So that in that case you would require to have more than one area?—I think you would.

2802. In fact, you would require to have the use of forests that were badly managed as well. That would be useful, would it not?—If you wanted to show work not done in the best way there would be no difficulty in making visits to such woods. You need not have any control over them. It is very easy to get a permission of proprietors to see woods managed on the old system.

2803. I ask the question because to say that the woods ought to be worked at a profit would perhaps to some extent handicap the teaching. Personally I would not like to advocate that the woods ought to pay?—I quite see that. I have said that, although the woods should be managed on economic principles, you would have an area for experiments. That particular spot of ground would, of course, not be managed for profit, although the forest as a whole would be so managed.

2804. You made reference to model forests or forest schools in other countries. As a rule do you find that the College, or the place where the class-room instruction is given, is quite near the forest, or do you know of cases where there is a considerable distance between them?—It is very seldom that you get forests very near class-rooms. I ought to remember very clearly the distance of the Forêt de Haie from Nancy School, and to the best of my recollection it is five or six miles.

2805. You would have them within an easy day's journey?—Yes; you cannot get forests at the door of the classroom.

2806. But you could take the class-room to the forest?—Yes, you could, and you would do so, under the scheme I have suggested for practical foresters.

2807. But not for the training of landowners and agents?—No; and simply for this reason—that the cost of a separate forest school for them would be so very high. You would have to provide separate professors and a separate establishment entirely, with students' houses, professors' houses, and everything else; whereas if you establish yourselves at a university you find a great deal already provided. I have always thought that some day or other we might have a separate forest school of that kind; that a demand for it might arise when the proprietors generally, having realised the value of the property they hold, were willing to pay much higher salaries than they do now for the management of their woods. Then it would be worth while for head foresters to come to get a superior education at the university. I quite look forward to that some day or other, but we have to deal with existing facts at the present time. Students of that class would not now attend the university.

2808. With reference to the interesting information you have given us with regard to plans and accounts, you say there are no returns, or very few returns, kept in Scotland, and very little hope of getting at the actual income from the woods in Scotland?—I should think so.

2809. Do you think it is due to any real difficulty or to a lack of interest?—There is no real difficulty at all. I think it is due to the fact that the woods have not been managed on business principles.

2810. There is a lack of interest?—A lack of interest.

2811. Would there be a considerable difficulty now in setting about drawing out plans for a large number of the woods in Scotland owing to the fact that they have been hitherto so irregularly managed? Supposing the owners were induced to go in for plans and books, would not they find a considerable number of obstacles at the beginning which would require a great deal of perseverance to overcome, and would not they require expert advice, in fact, to obtain a number of forestry inspectors?—I should like you to ask that question again.

2812. The first point was this: do not you think there will be a considerable difficulty now if you go into Scotland and draw up plans for existing woods owing to the fact that they have been irregularly managed?—I do not think so at all. The condition in which the woods are now has nothing in the world to do with difficulties in the plan. You have the woods before you; the problem is what you are to do. The worse they are the more necessary is the plan. If you had an estate thoroughly well managed, you might say it did not want anything; that might be said. I do not admit it would be right myself. The worse managed the property is, the more necessary it is to take it up in a regular way.

2813. You would require to make sweeping changes if you are going to set these woods in order now?—What do you mean by sweeping changes?

2814. For example, if you wanted to map out your area into definite rotations, would it not require sweeping changes in certain parts of the forest; would not you have to sacrifice trees half grown?—Nothing of the kind; absolutely not.

2815. We have been told that the woods are very thin?—I think if you will allow me I could give you in a very few words the sketch of the working plan I hold in my hand, if you think it worth while.

2816. (*Chairman.*) I was going to ask whether Colonel Bailey would not hand in the sheet of the working plan, and then the actual thing would be an appendix?—I should be very glad.

2817. You have the sheet printed—the form printed—that you recommend?—Yes, but Professor Campbell is on another point.

2818. (*Professor Campbell.*) I am asking about the plan, and perhaps the plan itself will be put in?—I understand you have asked me whether in the existing state of the woods it would not be difficult to frame a plan, and whether in order to carry out a plan great sacrifices would have to be made of young trees. My answer is, not at all. The problem before you is simply this: you first of all acquaint yourself with the actual condition of the woods, and then you have to say what is the best thing to do under the circumstances. That does not involve sacrifice. You must do the best thing without making a sacrifice.

2819. Do not you think that there would be a demand, supposing that landowners realised the importance of making these plans, for forestry inspectors to assist in preparing plans, that is, if any active operations were to be undertaken in the near future?—In my opinion a plan such as we are speaking about should be made by a forest expert, not necessarily an inspector.

2820. I use the word "inspector" in that sense; so that there is a need for a school for the training of such men, is there not?—Yes.

2821. (*Mr. Marshall.*) You have said that the necessary area for a State model forest would be 1,500 acres or more, if you could get it, and that depends entirely upon the nature of the land that you acquire, whether you have a certain portion on hill side, a certain portion facing different points of the compass, and a certain quantity of low land. Would it be essential to this scheme to have this land with some sort of forest or some sort of planting wood on it?—I think it would be most desirable. We should view with great disfavour a piece of bare land; it would take so long before you could show anything.

2822. It would take a long time before there would be anything to show or anything to instruct from?—Yes.

2823. (*Dr. Somerville.*) You place great weight, of course, on a proper system of forestry book-keeping?—Yes.

2824. I suppose you would define the various charges under different heads, would you not?—Yes.

2825. I suppose that a well-conceived plan of book-keeping prevails in the State forests of India?—Yes.

2826. Would it be competent for you to hand in to the Committee the form that is used in India for the keeping of the records of the results of forestry?—I feel quite sure I could obtain permission for that. I do not think there is any difficulty at all.

2827. (*Chairman.*) I suppose, Colonel Bailey, you

would say, although there was no difficulty in making a plan, it needs considerable technical skill in order to do it?—Yes. I understood the question to imply that you would have to make so many changes and so many sacrifices that you might do more harm than good. Certainly, in my opinion, to make a proper working plan you require an expert.

2828. With regard to the 1,000 or 1,500 acres which you consider a sufficient area, the least area that should be available for instruction in forestry, you include in that land planted as well as land to be planted?—Land stocked with trees now.

2829. Partially stocked with trees now, and partially unstocked; or do you mean that you want 1,000 or 1,500 acres of wood?—It would be very much better to have the 1,000 or 1,500 acres already stocked; the more stock you have on the ground the better.

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2830. But you may not be able to demonstrate if you had 1,000 or 1,500 acres?—I think so. What I mean with reference to Mr. Marshall's question is this. Suppose you have a flat piece of ground with the same kind of soil throughout; you could only keep repeating the same thing on it, whereas if you had a tract with various elevations, some rising to 1,500 or 2,000 feet, and some low-lying ground, you could have a different series of operations in each particular part. You might have conifers in the higher ground; oaks, ashes, beeches, and other hard wood trees lower down. To enable you to show many different crops a large area would be necessary. But then if you had it, this would save your having some other area elsewhere.

Mr. JOHN T. MAXWELL (Scottish Local Government Board), called; and Examined.

Mr. J. T. Maxwell.

2831. (*Chairman.*) You belong to the Scottish Local Government Board?—I do.

2832. You have given us an interesting statement (*Appendix XII.*) on the valuation of woodlands on which I will ask you one or two questions. Have you any official definition of woodlands?—I have no official definition of woodlands. In the statement which I have prepared I have dealt with ground under wood, whether as plantation or as woodland, which has been grown for the purpose of cutting.

2833. Ground under wood may appear, I suppose, as shooting, or grazing, or as woodland?—It may appear as shooting, woodland, or, in some instances, as grazing. It does so in the valuation rolls. The valuation roll may contain an entry of an estate as a woodland or as a plantation. I cannot say what distinction the assessors draw between woodland and plantation. I am not aware of what the strict definition is.

2834. The same area of land covered more or less with trees might be put under three separate heads of grazing, or shooting, or woodland in the valuation roll?—I would rather not answer that question. I do not feel quite in a position to do so. It might depend to some extent upon the individual assessing.

2835. There is no official definition to guide the assessor in classing a piece of woodland as plantation or as grazing or as shooting?—I am not aware of that.

2836. Woodlands which are grazed and shot over are rated at their grazing and shooting values?—Yes, on both.

2837. Therefore mature wood in a plantation which was grazed would be itself unrated?—Mature wood which was grazed?

2838. Mature timber in a grazed plantation which might be worth possibly a good deal of money would not be rated: merely the grazing would be rated?—The grazing value would be rated, not the actual value of the mature wood. That is perhaps the only exception to the general law of valuing in Scotland. Subjects in Scotland are valued as nearly as possible at their actual value—that is to say, the rent they bring, or, if unlet, the rent which the assessor considers would be a fair and equitable rent for the subject. Twenty years after planting a wood is, of course, much more valuable than it was when first planted; but still the value put upon it by the assessor twenty years after planting, or thirty years after planting, is exactly the same—the grazing value—as it was the first year of planting.

2839. On the other hand, wood, we will say, fifteen or twenty years old, which could not be grazed and was worth nothing, is rated at its full grazing annual value?—Yes. What the assessors do is to take the ground as if there were no wood upon it at all, and rate it at what it would bring in for grazing value—supposing there were no wood upon it.

2840. The wood itself, therefore, as a subject pays rates whilst it is worth nothing, and pays no rates when it becomes mature?—No. That was settled by a case in Court.

2841. It might be then worth a good deal?—That is so.

2842. The wood when it is worth nothing as wood has to pay rates because a grazing value is charged when no grazing could be carried on. When it is matured, possibly with a good deal of money, and the wood is grazed, the grazing pays the rates, but the wood pays nothing?—That is so.

2843. Have you had any complaints in regard to the system of local taxation of woodland?—The Local Government Board, so far as I am aware, have had no complaints.

2844. Has your attention been drawn to the recent report on the incidence of local taxation in Scotland?—By the Royal Commission on Local Taxation?

2845. Yes?—I have read that report.

2846. It does not contain any reference to the woodlands?—Not any special reference, I think.

2847. It makes no change?—I think not.

2848. In dealing with the improvements of local rates you describe very clearly the incidence of taxation as applied by the Parish Councils. You said 10 per cent. is possibly being given off land; 20 per cent. off houses, and 33 per cent. or even more off railways. In some cases the deductions are much larger than those figures, are they not? In the case of the Highland line, for example, it is only paying rates on buildings?—That is not exactly because of large deductions, but because of the method of valuation. The railway valuation is made by the assessor of railways, and he has a special method, according to the profits, I understand. It is because a value is not entered on the valuation roll. It is not because of very large deductions, but because of the railway assessor's value of the subject.

2849. I mentioned the point to show that these deductions, however they are made, involve heavier rates on other subjects?—Clearly.

2850. You say that in 799 parishes, agricultural subjects are rated upon three-eighths of the annual value, but that woodlands are rated on the full annual value?—That is so. Woodlands are universally excluded, as I said, from the term "agricultural land and heritage."

2851. Having had no complaints, you have not heard any expressions of opinion as to whether that is generally regarded as an equitable arrangement?—No, I have heard no expression of opinion.

2852. Again, on the subject of deductions, where the agricultural rate is insufficient to meet the five-eighths to agricultural occupiers, the parish would have to raise a rate to meet any such deficiency?—Yes. The occupiers would have to raise that rate.

2853. The occupiers would have to raise that rate?—I am speaking of parish rates only just now. There is a distinction with regard to county rates.

2854. Would part of the additional burden required to make good that deficiency be for the woodland?—Yes. If you will allow me I will state very briefly the method by which that deficiency where it exists is raised. Suppose a parish has to produce £500 of assessment, £250 of that amount would be raised from owners by an uniform rate. The other £250, less the amount of agricultural rates grant, would be raised from occupiers upon the occupiers' assessable rental, agricultural subjects being rated upon three-eighths only. Now, if the amount of the agricultural rates grant did not equal the amount of the five-eighths relief to agricultural occupiers, the deficiency would have to be spread over the whole of the occupiers. That is, a higher rate would fall upon occupiers than upon owners to make good that deficiency. Thus, in a parish the rate upon owners might be sixpence and the rate upon occupiers might be sevenpence, or even eightpence, ninepence, or tenpence per £, depending entirely upon the amount of

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deficiency and the value of agricultural land which was relieved of the five-eighths of its rental.

2855. But all woodlands would be rated to make up any deficiency, to meet the deduction of five-eighths?—That is so, woodlands among other subjects.

2856. You say that woodlands are rated upon the full gross rental. Is it not rather on the full net rental?—In county rates upon the full gross rental; in parish rates upon the gross rental under deductions mentioned in the 37th Section of the Poor Law Act. Parish rates are levied on the net annual value; county rates are levied on the gross, as appearing in the valuation roll.

2857. But the county rates would be levied on the unimproved pastoral value of the land under timber?—Yes.

2858. To get the rent of that you would deduct the cost, if it was part of a sheep farm, of the shepherds; therefore it would be the full net rental?—All the county rates are levied upon the value in the assessor's roll. It is for him to determine what shall come off.

2859. Woodlands, so far as the incidence of the rating is concerned, are more heavily rated than agricultural land. They have no deduction under the Agricultural Relief Act?—In the great majority——

2860. They are liable to make good any deficiency under that Act?—That is so. We would have to limit that however to those parishes which have no classification of occupants for rating purposes. In county rating woodlands always pay upon the full rental. In certain classified parishes, however, woodlands are rather more favourably treated. Indeed, in a number they are treated as favourably as agricultural land. In these parishes, of course, they are not worse off with regard to rates than agricultural land.

2861. That is a very small percentage of parishes in Scotland where they do receive any favourable treatment?—Very small indeed. I have an example here.

2862. I think you have given them in your statement?—Yes.

2863. (*Dr. Somerville.*) I suppose there are cases in Scotland where the woodlands are handed over to the agricultural tenant to work for his own advantage?—I have had no experience in these matters, and cannot answer that.

2864. You are not prepared to speak of the English system?—No. I can only speak to the rating of the Scottish system. I am not up in the English system.

2865. I suppose then that the general principle that guides the rating of woodlands in Scotland is that an assumption is made that the return to the owner, when his land is planted, shall be just the same as the return when the land was under pasture?—Yes.

2866. And if land unusually suitable for forestry is utilised, then the rating on the owner will be relatively very favourable, but if the land that is very unsuitable for planting is put under wood, then the owner, I suppose, will suffer somewhat?—That would follow naturally.

2867. This then places, as it were, a premium upon good selection for the purpose of forestry?—Yes.

2868. I suppose that in the case of woodlands it is the unimproved pastoral value that is taken as the basis?—It is practically the value of the ground before it was planted.

2869. Unimproved?—Unimproved. The term of the Act is in its "natural state." "Where lands and heritages consist of woods, copse, or underwood, the yearly value of the same shall be taken to be the rent at which such lands and heritages might in their natural state be reasonably expected to let from year to year as pasture or grazing lands."

2870. Supposing in a case a landlord has a field of 20 acres which is under grass and is let only at £20 a year, and he makes up his mind he will put those 20 acres under trees, would the rateable value remain at £20 a year?—Yes.

2871. But still the grass field before it was put under trees may have been drained, limed, and manured, and improved in a great many ways, to bring it up to the pastoral value of £1 an acre, and the £1 an acre is no longer the value of unimproved land, but is the value of highly improved land. So that I suppose the woodland rate subsequently would remain as it were on highly improved land, and not on land in its natural state?—I should say that would be a question for the assessor to settle when fixing the value.

2872. In other words, we must not, I suppose, take this term unimproved or natural condition as being invariable, because this same land which as a grazing field was worth £1 an acre may in its natural and unimproved condition be worth only 2s. 6d. an acre?—I am sorry I cannot speak from that point of view.

2873. We have already had before us the case of an area of comparatively matured woodland which is used for the purpose of grazing, and assuming that the unimproved value of this land is 2s. 6d. an acre, and further assuming that when the comparatively matured wood is pastured by sheep it is let for 2s. 6d. an acre, then it has been said that the trees on this area escape taxation. Apparently the wood escapes taxation, does it not, if the land is let for 2s. 6d. as grazing land, and it is carrying a stock of timber worth £20 or £30 an acre; then this timber is not being assessed?—It is not being assessed if the land is worth for grazing purposes as much with the timber upon it as it would be if there was no timber there.

2874. There are, I believe, plenty of cases where a certain amount of timber on the land does not interfere with the pastoral value?—Yes.

2875. But, as a matter of fact, is it not the case that the timber after all has not escaped, because during the 30, 40, or 50 years, when the wood was enclosed, and no sheep were on it, the land then was assessed also at its unimproved pastoral value, and yet was returning no income at all to the landlord because it was not being grazed? Is it, therefore, not a fact that after the wood is thrown open to grazing it is then, as it were, bearing the rate which had been put on before it was opened?—I do not quite follow that question.

2876. I will just take a specific example. We have an area of ground which in its unimproved condition is worth 2s. 6d. an acre. This area of ground is planted with trees, and during the first 40 years no stock are allowed into the wood, and, therefore, the return to the owner, if any, comes from timber and the shooting. He at that time is assessed on a basis of 2s. 6d. an acre. After 40 years we will assume that the wood is thrown open to stock, and it may be to grazing, and is let, we will assume, at 2s. 6d. an acre. Now from the fortieth year onwards the landlord is really getting 2s. 6d. an acre from the grazing of this particular wood; but the area would be carrying timber worth £40 or £50 an acre, and that timber appears to be escaping assessment because the landlord is paying only on the 2s. 6d. he is getting from the pastoral tenant. I want to know if you agree with me that although the timber appears to be escaping assessment it has been really paying rates during the first 40 years when the landlord was receiving no pastoral rent?—Clearly.

2877. Therefore, I think, although it may perhaps appear to be the case that woods which are grazed are escaping assessment so far as timber is concerned, that that timber has already, during the time the wood was enclosed, paid its fair share of rates and other things?—Yes, in the example you have just mentioned.

2878. (*Chairman.*) In your experience have you found that the practice of assessors differs very widely or differs at all in different counties in fixing the rates which woodlands should pay?—I cannot say I have. Of course there will be differences, but I think on the whole they are not great. The Inland Revenue officers, who are the assessors in 24 out of 33 counties, should at any rate act upon the same principle.

2879. They are assessors for the Inland Revenue Office?—Yes, they are also local assessors in these cases.

2880. What is the local assessor usually by profession; is he a land valuer?—Sometimes he is a solicitor. Twenty-four out of the 33 county assessors are officers of Inland Revenue. The remaining nine have other professions. I think in one or two cases they are solicitors.

2881. I understood you to say that the Inland Revenue officers or other assessors employed assessors?—No; the Surveyor of Income Tax may, under the Act of 1857, also be the local assessor, in which case no charge is made upon the local body for salary of assessor.

2882. Then these valuations are made either upon the returns sent in by the landlord or by the men who have perhaps very little experience of the value of land?—I understand that in some counties, at any rate, the Inland Revenue surveyor may have the assistance of an expert in land to assist him in valuing—in Perthshire I believe that is the case—in which case the cost of the expert is borne by the county authority, the county council.

2883. It seems rather desirable, does it not, that these valuations should be fixed by men who know something of the value of the land?—I am not aware that the number of complaints or appeals would justify any change.

2884. I am not suggesting that there are any complaints. The fact that 24 out of 33 counties have employed the Government assessor would tend to show that in these cases they do not think it was necessary to employ anyone else?—They can employ whom they please as the assessor. *Mr. J. T. Maxwell.* 6 May 1902.

2885. You think, on the whole, the values are properly fixed?—I have no reason to believe they are not. Of course, there are two appeal courts, an appeal to the committee of the county council or of the magistrates of burghs, and from that to the two judges of the Court of Session.

2886. If you appeal to the county authority, you are appealing to practical men?—Yes, you are appealing to practical men.

Major P. G. CRAIGIE (Assistant Secretary to the Board of Agriculture), called; and Examined. *Major P. G. Craigie.*

2887. (*Chairman.*) I suppose we may take your statement as read (*Appendix XIII., XIV.*), and ask you questions upon it. As to loans, do you think it would be practicable that the State should make the advances direct to those who desire to make woodlands?—The question, I think, has been raised, as you are aware, before the late Royal Commission on Agriculture, of the State advancing loans for this and other agricultural improvements.

2888. What is the view of the Department?—The view of the Department is stated very fully by Mr. Elliott in the evidence taken on the 15th March, 1895. As the Commission's notes of evidence are in the hands of the Committee I need scarcely recapitulate them. Perhaps I might be allowed to add that the policy is a very old one, the State's interest in promoting certain agricultural improvements dating back to the year 1846. There was a proposed revival of that older policy in the second report of the Commission, dated 7th February, 1896, and the special questions relating to loans for planting will be found on page 321 of the Minutes of Evidence, Volume III. If I might pursue the subject as to the orginal policy of the State, I would point out that it was limited simply to making advances by the State for the drainage of land. In the years following, 1846-7-8, the expenditure of public money was somewhat considerable, both in Great Britain and in Ireland, on this class of improvement; but although the subsequent system of loans by companies embraced many other matters, planting was not largely thus assisted.

2889. Have you any opinion as to why these loans have been so little taken advantage of?—I think there is a good reason in the case of planting, because there is no immediate return to the owner of the estate; whereas there is the immediate charge for the interest and share of the redemption. In almost all other agricultural improvements, such as we are dealing with every day on a pretty considerable scale, there is some return as soon as the improvement is completed. Farm buildings are paid for in increased rent, and other improvements are paid for by improved returns, or maintenance of rent that would be otherwise reduced. But as regards planting, there can be, of course, no immediate return to the owner of the soil.

2890. Do you think that the system of granting loans might be so arranged as to encourage the use of loans for woodlands, without, of course, involving the State in any risk?—In another system than the present one whereby companies advance the money?

2891. Yes?—I think there would be great difficulties in getting State money. But that is a question of policy. It is hardly possible for an officer of a Department to say what the policy of Parliament would be in the matter. There would be, of course, no absolute impossibility in administering a State loan. It is a question of how far the State would advance money on the security available.

2892. Do you think it would be possible to have loans, advancing money on mature timber alone, as apart from the land where it was grown, on a fixed rotation, showing a fixed annual income. We have had some evidence, which perhaps you have noticed, from Mr. Forbes and others?—I had my attention called to that proposal last night, but I do not think I quite understand it. I should like a good deal more explanation before I gave a final opinion, but on the first blush it does not strike me as a proposal that could be worked. I presume the charge would not be only on the growing timber; but, as a matter of legal obligation, the charge would be on the whole land, and the timber growing upon it. I presume that is the idea?

2893. No, the timber alone?—I gathered from the memorandum that it was the timber alone, but legally I am not quite certain—I am not a lawyer myself, and speak subject to correction—whether there might be a doubt whether you could properly mortgage the timber which is a part of the realty until severed from the estate. Timber is really a part of the estate, which might be already mortgaged, and although I speak subject to correction from lawyers, I doubt the advisability if not the possibility of a second charge of this sort.

2894. The interest of the subject, of course, would naturally have occurred to you in connection with heavily mortgaged estates, where possibly there is a large amount of wood which cannot be mortgaged for the reasons which you have suggested, and the point is whether in this case it would be possible by having a fixed system of felling, so as to show a fixed annual income, to mortgage the wood, and obtain an advance, to be devoted under proper supervision to the extension of plantations or to replanting?—I think there would be very great difficulties of an administrative character in any such plan as that of Mr. Forbes. I think you would have to vest the management of the wood in some outside body, even if it would be possible for the State to advance money on such a mortgage. I do not quite see what the power of recovery would be; assuming the first instalment was not paid what would be the action taken by the State? Would it seize and sell the growing wood?

2895. That would be their remedy, I imagine?—I am afraid that the mere administration of work of the kind suggested would lead to a great deal of friction in the management of estates if it were possible on other grounds.

2896. I have no doubt there are great difficulties, but I wanted to have the benefit of your opinion with regard to them?—I have looked at it as carefully as I can in the short interval I had, and I am afraid the scheme bristles with administrative difficulties. In the first instance, of course, there is the proposal for deferring any payment, I understand, of even a low rate of interest suggested. Therefore the loans could not be granted in the fashion they are now done by the companies, and then the charge sold by them to insurance companies, which is the way all land improvements loans are worked at the present time, because no insurance company or other person lending money could stand out of their money for a few years. There must be a proportion paid from the very beginning, and that would make a difficulty. If the State were to do it, of course, it would require legislation, and I presume it would be intended to place any charge of that kind in priority to existing mortgages on encumbered estates. That would probably be resisted very much as a measure of practical legislation.

2897. Then you are not very sanguine of anything being done for forestry by way of loans?—Not in that direction.

2898. Or in any other direction than that now in practice?—I think the question of the period for which the loan might be made is one quite open to argument. In the evidence to which I have already referred before the Royal Commission, it was pointed out that the rate of interest was not so much a matter of consideration as the period over which the instalments were extended.

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If you made the calculation you would find that a rate of about 3¾ per cent., which I understand is about the company rate at the present moment, would mean on a charge of 40 years something under £4 17s. per cent., whereas a charge at the same rate for only 20 years would amount to something like £7 per £100. The payment is a very much greater burden in a short period of charge. In a long period of charge it is much lighter, and therefore any relief in the payment of a loan would be greater by lengthening the period than by reducing the rate of interest, assuming the Government could lend at a lower rate than the companies, for I understand the suggestion is that the Government might lend rather more cheaply. At present the rate is about 3¾ per cent. in England, but I am bound to say that in Scotland the rate charged by the company operating there is believed to be a good deal higher. The cases are so very few in which planting now comes before us as a subject of a loan at all that it is a little difficult to generalise. Compared to other improvements it is infinitesimal, and there are almost no cases coming under our notice where planting is required as an improvement by itself. As a rule it is a small subsidiary outlay in large improvement schemes for an estate. There have been only nine cases since the passing of the Act of 1899, which has enabled us to give extended facilities. The total amount of money involved in those, as I showed in the memorandum I have handed to the Committee, is a very small matter (*Appendix XIII.*).

2899. At any rate, there are serious difficulties in the way of anticipating any extensive results for forestry under the loan system?—That is so, unless any relaxation of the period of the charge is made as is now possible under the Act of 1899. Under the old Improvement Acts no charge of that kind could be spread over more than 25 years. Now it may be spread over 40 years, and even if the charge already given has been for a shorter period like 25 years, there is power under this new Act to the Board of Agriculture after inspection within a limit of time to enlarge the charge up to a maximum of 40 years. We have had no application to put in force that provision of the Act, but that power was given us by Parliament in 1899 with the view of facilitating loans for forestry, so that where the actual planting was again submitted to inspection a prolongation of the time might be given. But this will not be feasible, I am afraid, as a matter of practice very often in the case of charges by companies where they have to sell the charges originally fixed.

2900. Another difficulty would be, would it not, that any expenditure in connection with State loans—of such advances by the State—would have to be very carefully supervised?—That is so, and that would mean a considerable expenditure beyond the mere charge itself.

2901. Much more supervision would be required than in the case of any agricultural loan?—It would require a more continuing supervision I imagine; more frequent inspection possibly.

2902. You might have a whole plantation killed by rabbits in a week?—Quite so. In the same way with regard to the suggestion of charges on growing timber, you are liable to many accidents, such as the blowing down of large tracts of forest and the burning of the forests.

2903. The burning might be covered by insurance?—Yes.

2904. One other subject as to which I would like to ask a question or two is with regard to the area obtained from the Ordnance Survey and from the Agricultural Returns, the decennial returns I think they are?—We have obtained statistics at varying intervals in the agricultural returns of the Board of Agriculture, as shown in Memorandum B (*Appendix XIV.*).

2905. Have you any official definition of woodland?—No, that is exactly the point in which such enquiries are defective. The agricultural returns of woods which were taken first in 1871, and again at the different periods detailed gave no definition. The nearest approach to a definition was in the regulation of the 1871 returns, where the acreage was asked for "of woods, copses, and plantations, except gorse land and garden shrubberies." That was more in the nature of a definition than any we have had since. Since that date it has been "woods and plantations." In the two enquiries made in 1891 and 1895, which were more immediately under my own control, we took steps to have a more exhaustive local enquiry into what was being returned to us under those heads by obtaining the co-operation, as far as possible, of landowners and land agents with the Inland Revenue officers, and I think, therefore, those later returns were more complete, but I cannot say that in any case there was an identical definition of what was a wood. But in the case of plantations we inserted in 1891 a proviso that land planted within the last ten years should be regarded as a plantation, and in the enquiry in 1895, which was intended to be supplementary to the 1891 enquiry, we asked for a return of all the plantations that had been planted since 1881, making it a period of about 15 years. So that we have in the two last enquiries something like an enumeration of plantations as distinct from woods, and I do not think there is much risk of error on the ground of absence of definition of a plantation, although there might still be in the definition of a wood.

2906. Do you think it is possible to make a more precise definition to such an extent as would enable us to judge whether the woodland area is really increasing or not, because although the returns show there is an increasing area, that may be entirely due to increased accuracy?—I think that very largely, as I have pointed out in my memorandum, the apparent increase must be due to the increased exhaustiveness of the return, because it coincides with the apparent increase of areas where we know that large areas of woodland have been blown down or cleared. There are individual cases which I myself investigated which leave no doubt in my mind that that increase shown in the return is partly at least a nominal increase owing to more exhaustive returns.

2907. Do you think anything could be done by giving instructions, either to the Ordnance Survey or to the officers that act for you in your Board's returns, to enable us to ascertain more clearly whether forestry is progressing or retrograding?—Your reference to the Ordnance Survey suggests a wholly different method of ascertaining areas. As the Committee are aware, the enquiry of the Ordnance Survey is, if not exactly a cadastral survey, yet a survey on the ground, wherein every acre of the land is recorded. On that local survey is shown, according to the opinion of the officer making the survey, what is and what is not wood.

2908. Then he has no very definite instructions to guide him in returning that as waste or grazing, or as shooting, or as woodlands?—The Ordnance Survey officers in making their enquiry, I am informed by the Director-General, regard as woodland any groups of trees of any age and of any description, except where these are in parks and pasture land, where unfenced clumps of trees are not treated as woods. Underwood on the Ordnance Survey maps is distinguished from woods, and computed separately whenever it is possible. As the Committee are no doubt aware—and I have specimens of the different maps here—on the Ordnance Survey plans fir woods are shown in a different category altogether from deciduous woods; and mixed fir and deciduous woods are shown in mixed character. Those parts of the country in which the 25-inch map survey has been completed have had all the areas of woodland separately computed. The computation books made up locally, but not published, have the data, but no recapitulation of the aggregate woodland areas has ever been made. Any such recapitulation, or putting together of all the computation books, would necessarily entail picking out the woodland area out of the thousands of computation books. It would be very laborious and very costly. It would be of very little value when it was completed, because, as the Committee are aware, different parts of the country have been surveyed at different times, and each computation book can only give the area in the opinion of the officer and the measurement of the officer at the time when he made the survey. These dates may differ by 20 or even 30 years in different parts of the country. Some parts of the country have not been surveyed on the 25-inch scale at all as yet, although they have been completed on the 6-inch scale, and on those parts the area of woods has not been computed. So that the Ordnance Survey cannot be relied upon to give us at any given moment an exact picture of all wood areas even under that definition which I have read to you. The agricultural returns, on the other hand, are taken for a given year, and do give, in however faulty a fashion, the local estimate of the area of woods in that particular year for all parts of the country. There is a great difficulty in comparing the two systems. The only way I can see in which we could arrive at an absolute figure for a given year would be the establishment of a regular cadastral survey, such as many foreign States have carried out, at a given date, of the whole area of the country, showing how it is occupied, using, perhaps, in the process both the Agricultural Returns and the local assessment figures and the

Ordnance Survey data for the purpose, as far as they are respectively available, and bringing them up to date. But I need hardly say this would be a work of immense cost, and take a long time. That would be the only exhaustive process.

2909. You think there is nothing more to be done? The instructions to your correspondents or officers are just as clear as those to the officers of the Ordnance Survey?—I should not like to say nothing could be done to still further improve the returns, but I do not think that any more exhaustive return would give us the means of comparing more accurately the present areas of woodland with the previous position, or enable you to show whether woodlands had grown or declined, because the very fact of making the return better and more correct would make it of less use for any comparison. I had rather hoped that possibly this Committee in its Report might be able to suggest some effective definition which would enable us, the next time our department makes an enquiry into woodlands, as I have no doubt we shall have to do before long, to define more closely what a wood is. It would really be a matter on which advice from practical men would be of value.

2910. One other point, with regard to agricultural education, I should like to have your opinion upon. You give assistance to various agricultural training colleges and other institutions on the basis of a proportion of the expenditure incurred, do you not?—There is no fixed basis. We take into account the amount of local support that is forthcoming before any State grant will be made, but we do not necessarily apportion it exactly to expenditure. To give State money exactly in proportion to expenditure would be rather to encourage extravagance.

2911. I mean that you always get some local assistance. You do not bear the whole cost?—No. In no case do we bear the whole cost; we always take note of the local assistance forthcoming, and we have endeavoured to the best of our ability to give as much as Parliament allows us to have for this purpose, always taking care that there is some local support, and good work done.

2912. Is the percentage which you give ever very large, or is the bulk of the expense levied locally?—I could hardly answer that question generally. You are referring now to the question of planting or forestry?

2913. No, to the grants that you give in aid of agricultural instruction?—Speaking broadly, the State provides for agricultural instruction something like £8,000 in England and Wales, directly through the Board of Agriculture. But it also provides another very large sum through the Local Taxation (Customs and Excise) Act payment handed to the different counties for administration, which is also State money handed over and available for education, of, perhaps, ten times that amount. That is only a rough estimate, made on the basis of the last report of the Department.

2914. Do you give any grant at present for forestry education?—My own connection with the educational branch of the Board's work ceased in December last, but in the last report issued it was shown that although the Board does not make grants allotted to particular subjects, we do give certain grants to various institutions which have forestry in their curriculum. Although my colleague, Dr. Somerville, knows better about the most recent details than I do, I think that at Newcastle, at Cambridge, at Wye, and at Leeds, this subject is taught in the provincial colleges, which are subsidised to the extent of the Board's full grant, which is £1,000 a year. Some portion of that outlay, therefore, is applied to forestry.

2915. (*Dr. Somerville.*) I should like to place myself in the position of a necessitous borrower who has an area of land, and who desires to put a good proportion of that land under plantations, and who desires to come to the Board of Agriculture for the necessary financial assistance. Suppose that one were going to create a plantation by means of a loan through the Board of Agriculture, what steps are taken?—The first step usually taken is either to come direct to the Board with an application for inspection of the site which is proposed to be treated, or, in the majority of cases, to go to one of the companies—there are only three companies at work now; there used to be four—and these companies come to the Board with the same application.

2916. So that the application may be either made directly to the Board or through the medium of a company?—Yes. If you as a landowner applied to my division of the Board to-morrow as to how you were to proceed you would receive a copy of this circular, which, if you like, I will hand in to the Committee, which specifies the particulars with regard to the improvement that you wish to make. That being filled up, the Board would direct one of our permanent local inspectors situated in the different districts, who are the most prominent and qualified surveyors or land agents, to go and inspect the site. But it is an illustration of the very small extent to which planting enters into any of these applications that the word planting only occurs in one line, under Item No. 9, of the subjects of proper expenditure on improvement. The wording is only "Clearing, trenching, planting; probable maximum cost." That is all that has to be filled up in the first instance *qud* planting. Then the Board receives from its inspector a report on the nature of the work that is intended and the adaptability of the site to the particular purpose, and generally on any feature connected with the estate which is required for the arrangement of a charge under the Acts described in my memorandum, and then a Provisional Order authorising the expenditure is made by the Board. After the work is completed a second inspection takes place, the Board again sending its officer, and, on his reporting that certain work is done satisfactorily, the absolute order is issued either to the company or to the individual, and that absolute order creates the charge on the estate for the period named therein. These are the steps which I understood you wish to know.

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2917. Might I just ask for some supplementary details; does the inspector on his first visit estimate the probable cost?—Certainly. He has to state this, and information for this purpose is given to him by the agent of the estate. There must be in the application to us an estimate, however rough, of the intended cost. It need not be always absolutely adhered to, as circumstances may arise when the landowner may come to us afterwards and ask us to modify the same on good cause shown, but there must be an initial estimate of what is intended to be the cost.

2918. Then the Board issues a Provisional Order on the strength of the first report of the inspector?—Yes.

2919. Is the owner of the land left to carry out the planting in such a way as he may desire?—Yes, subject to the official final inspection by the Board's inspector, as well as to the preliminary inspection. If the result is unsatisfactory, of course he does not get his charge, or he might not get it for the whole amount. The inspector must certify the amount actually expended, and he would draw the attention of the Board if there was an unduly extravagant or improper expenditure.

2920. And the owner of the woodland may borrow the full amount from a land company?—Yes, if he makes his contract with the company. Sometimes he provides some of the money himself. There is another method by which planting, as well as other improvements, can be proceeded with, and that is where landowners under the Settled Lands Acts 1882-1890, can use capital money in the hands of their trustees for planting, who come to the Board only for the approval of the surveyor nominated by the trustees, who is not in that case necessarily one of the Board's officers, to certify the outlay to be properly incurred. Then there is an alternative to this procedure whereby, also under the Settled Lands Acts, where settled money is available, the parties can apply to the Board to get an inspection, and have the outlay certified by the Board itself. These last cases are very rare, but we have a few of them. Planting is sometimes included in the ordinary improvements carried out under the Settled Lands Acts without the details coming to our knowledge.

2921. Does the landowner determine the length of time during which he shall pay interest and repay capital?—In the case of loans for planting the length of time is determined by the Board. That is in the discretion of the Board. According to the different companies that he may go to, there may be a little qualification of that. There are some companies which have a minimum as well as maximum, but the maximum of the Board now applies to all companies, and that maximum is now 40 years. It is quite in our power to say that this work is of such a nature that we will not give a charge for more than 15, 20, or 25 years. Twenty-five years is a very common period.

2922. During that 25 years the rate of payment is so adjusted that both capital and interest is paid?—Yes. The loans are cleared off at the end of the period.

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2923. Does the Board or any company exercise any sort of supervision over the management and existence of the woodland after the loan is sanctioned?—None whatever as far as I am aware, beyond the statement as to upkeep made annually where the case is not under the Companies' Acts. In the latter and more usual case, the moment the loan is issued and the charge is made, the practice of the companies usually is that the charge is sold to an insurance company, and there the matter ends so far as either the Department or the companies are concerned.

2924. Then I suppose the general principle of these loans is that the estate on which the improvement, in this case planting, is effected, should be benefited to the extent of the expenditure to effect this particular improvement?—Quite so, directly or indirectly, in the case of planting. We have a little more latitude than in the case of farm buildings, because, as I pointed out in my Memorandum A before the Committee, the old Acts recognised in the case of planting that it was not necessary to prove immediate pecuniary benefit to the estate. There is general and indirect benefit in the way of amenity and general improvement which has to be taken account of beyond the actual money return.

2925. And the whole estate is mortgaged for the repayment of the loan?—Not necessarily the whole estate in all cases, but a sufficient area of the estate to justify the charge. That is again a matter which would have to be submitted to us.

2926. It is quite conceivable, I suppose, that the owner of the estate may fail to take sufficient precautions to insure the existence and healthy development of the plantation that has been so created?—I am afraid it is quite possible that that might happen.

2927. And it is conceivable that an estate may be burdened by a considerable loan for the purpose of effecting an improvement, and yet this so-called improvement may be so neglected that an estate may be little, if at all, benefited by the charge that has been made?—It is quite conceivable that that may happen. Against that, though, I would put the fact that it must be remembered in dealing with this that the amount of money borrowed for planting is excessively minute. In the whole woodlands of the country there must be a very small area which in any way owes its origin to the loans through this cause. The total sum spent on planting from the beginning of the system more than 50 years ago does not yet reach £100,000.

2928. Under the present system, of course, it is not to the interest of the State or of the companies to secure good management in the woods that are created in this way, because the rest of the estate, or a portion of the estate, is burdened for the creation of these woodlands. But if it were conceivable that the woodland itself were burdened with the loan, then I take it it would be quite necessary for someone to see that this woodland so created was actually maintained; and also that it was properly managed and utilised?—I think that would be so, but it would require a very large area of woodland to give the security. You could not do that in the case of very small properties. You want a large margin to fall back upon if it were limited to woodland. Perhaps I ought to add that, referring again to the point, there is a value beyond the mere keeping up for timber purposes; we find as a matter of practice that the planting is often recommended on the ground that it adds to the saleable value of the estate from reasons of beauty, amenity, sporting and various other considerations. Woods might thus be kept up in some form, although there was some neglect from the purely forestry point of view in the maintenance of the woodland. There are often old woods which would be of great value to the estate in the market, and therefore the value of the loan is secured in a sort of way, although there was some neglect of the timber value.

2929. (*Mr. Marshall.*) You have very kindly given us some information about the Ordnance Survey, and you told us that there is a certain definition that trees that are grown in groups are described as woods, and those that are grown singly in pastures and parks are not taken into the woodland area. In some counties, particularly in the South of England, there are very woody hedgerows, which are locally called rows. Could you tell us whether those are included in the woodlands or, in the agricultural term, as part of the field?—I think perhaps, if the Committee will allow me, my best answer is to hand in a copy of the 25-inch Ordnance map. This is part of the County of Sussex. The areas scaled on that map will show you where the strips are wide enough to be entered, which is really an answer to the question. A good deal depends on whether these narrow strips are inclosed or not. I would call attention to the fact that in one instance this strip of woodland would not be measured as wood, whereas the other strip would be measured, the difference in the two cases being the fence, keeping the wood in; but very much must depend on the closeness of observation of the officer making the survey, and the fencing at the moment when the survey was made.

2930. You very kindly tell us that 102,671 acres of plantation have been planted within the last ten years?—Not within the last ten years. We have had no survey of woods at all since 1895, and the area of plantations at that date regarded as plantations was everything planted between 1881 and 1895.

2931. There is a good deal of agricultural land gone out of cultivation within the last ten years, is there not?—There is a certain amount, not a very large percentage, gone absolutely out of cultivation; but a considerable percentage has gone out of arable cultivation and into grass.

2932. Have you any knowledge that any of this land which has gone out of cultivation has been taken advantage of to plant?—I have. We have cases where enquiry has been made as to why the cultivated area of a given parish has been reduced, and the answer is given that a certain proportion has been used for plantation. I do not say these were very numerous cases, but such cases have come under my knowledge. One main cause of the land going wholly out of cultivation is the encroachment of towns on the country. It is not always recognised that the taking up of land for building is a very important element in the movement.

2933. As you have only had nine applications since 1899, and the total amounts charged since 1847 are something under 100,000*l.*, the people who have availed themselves of planting their lands have not been to the Board of Agriculture or land companies to borrow from them?—It is very rare that applicants come to us for loans under the Acts for planting only.

2934. During Professor Somerville's question I think he said something that these loans were payable capital and interest together?—That is so, in regular instalments.

2935. The number of years that the money is borrowed over is put into a lump, and the interest calculated, and that is divided into so many periods?—Yes, spread in exact proportions over the whole period.

2936. Since the period has been extended from twenty-five to forty years you have had nobody take advantage of that at all?—Since the passing of the Act of 1899 there has been no application made to the Board to extend a charge previously granted from the twenty-five years, which would be practically what had been given, to the forty years. I may mention that out of the nine cases which have come before the Board in the last two years, which has been the period since that Act came into operation, just two of these have had a maximum period granted to them on their original application. But there is no case in which we have been asked to take advantage of a section of the Act which enables us to extend an earlier charge to forty years.

2937. (*Sir John Rolleston.*) Do you say there were only nine applications since 1899?—Yes, for planting.

2938. I have never heard of one or known of one?—I should think that very many of our inspectors have never heard of them at all. I have only taken charge of this department during the last few months, but I have examined the older entries, and nothing has struck me so much in looking up these figures as the fact that the records are very few of special loans for planting alone being asked for. We get all sorts of subjects. The extension of mansion houses is one of the largest, and expenditure for labourers' cottages occurs very frequently. It is only rarely now that we have drainage, but drainage is more frequently asked for than planting. Planting is, of all subjects, very much the smallest, and I think that is quite clear from the data published in the last report of the Board, and in the memorandum I have handed in.

2939. Do you think that landowners know generally that they can borrow money for planting?—I do not know how far it is generally known among landowners. It is, of course, well known to the companies, and companies, being commercial and buinesslike institutions, have every interest in spreading public knowledge of the fact that they can do this, because they take a certain profit upon each transaction. There are no surer

means of getting things known in this country than allowing people to have a commercial interest in promoting the work. The companies themselves, under Act of Parliament, are entitled to make a commission of 5 per cent. on the outlay.

2940. Only the companies would rather effect loans for building and that sort of thing than planting, because of the security. Security is necessarily the difficulty in this class of loan?—Quite so. And they could not well take a loan which would be liable to be altered and extended in period. This would clash with the practice of the companies in selling those charges to insurance companies. It would not be as a matter of finance a very easy business to have anything but a loan for a fixed definite term to begin with in these cases. Therefore, where the money is coming through the companies I do not think extension can be often granted by means of Clause 2 of the Act of 1899.

2941. It seems very necessary that the plantations should be made under Government supervision, does it not, before much money can be lent in that direction?—I think the State would not lend without very close supervision, and the cost of that supervision would be almost prohibitive to the commercial advantage of planting, perhaps.

2942. I think you said in the first few years the life of a plantation might be completely destroyed?—Entirely; it would be a very difficult matter to control.

2943. I was glad to hear you say that the Government Department had recognised that plantations improve the value of an estate beyond the actual value of the wood, and that they are prepared to count this added value in their security?—To take that into account in determining the security, I think, is only fair. We consider this is a matter of ordinary market practice—an estate sells better when nicely timbered.

2944. There have been several witnesses before this Committee who have been unanimous in the expression of opinion that a well planted estate is more valuable than the bare estate, apart from the value of the wood itself?—Yes, quite apart from the timber value.

2945. What do you call gorse land?—Land covered with whins or gorse.

2946. Which is let for grazing purposes?—Not always; some of these areas contain a sort of rabbit warren.

2947. Are fox covers included in your return of woodlands?—I think probably not, gorse land is omitted.

2948. Fox covers planted with gorse and blackthorn and privet are regular enclosures. There is a very large area in the Midland counties of land planted in that way, which would not be woodland?—I should like to reserve an opinion to how far they are or are not wood under the Ordnance Survey. I have known a case of the Ordnance Survey maps showing an area as wood the extent of which was only ·017, and another ·019 of an acre, so that a very small corner with something growing on it of the nature of wood must have been regarded by an officer as wood.

2949. The principal planting in some parts of the Midland Counties seems to be fox covers?—I do not know that I should go so far as to agree to that.

2950. Do not many landowners plant fox coverts?—There is no doubt that the question of planting for sport is an element in planting. A good deal of the plantations we have heard of lately have been planted with a view to game.

2951. They have a sporting value?—Yes, apart altogether from the value of mere appearance or the value of timber.

2952. They have a higher value than open land?—Yes, as making covers.

2953. New plantations?—Quite so.

2954. (*Colonel Bailey.*) I am not quite sure whether I rightly understood you to say that the returns made by the Agricultural Department are not based on the Ordnance Survey?—Not in any way based on the Ordnance Survey.

2955. The Ordnance Survey is not used for your purpose?—I should qualify my answer by saying it is always open to a local officer of Inland Revenue who is in doubt as to the figures sent in by the occupier, to refer to a map, and there are cases, where some puzzling questions of area have cropped up, in which in our own office we would naturally refer to the ordnance map on a point of correction, but the returns are not based on that primarily at all. They are based on the schedules returned by persons on the list of occupiers as given locally, although the rate books, as you are no doubt aware, are sometimes very imperfect, but still the rate books are open to the inspection of officers who take the agricultural returns; and by their aid and local knowledge the schedules are addressed to all the occupiers of over an acre of land.

2956. I think you said you were willing to accept a suggestion from this Committee with regard to some definition?—We should be only too glad.

2957. You have at present woods shown under two heads—plantations and woodlands. Are they shown together or separately?—Separately.

2958. Plantations such and such a year and woodlands for the same year?—Yes, for each county in the returns. I can show you exactly how they are entered. (*Handing in returns.*) That is the most recent return. Every county shows the amount of woods and the plantations.

2959. There are just two headings?—Yes.

2960. Take the case of an area from which a matured tree crop has been cut, but on which no replanting has been done, what would that be called? I ask you the question because it is within my knowledge that on some estates there are areas which have been bare of trees for 10, 12, or more years, and which it is the intention of the proprietor to replant. To all intents and purposes they are woodlands on which the crop is at zero at the moment. How would you class them?—That is no doubt one of the class of cases which have caused a good deal of difficulty in the returns. I have myself no doubt that the officers employed in collecting the returns may have differently interpreted their instructions in such cases. There was an instance in the county of Inverness when I was making the last report, in which the exclusion of an area of so-called forest was explained on the ground of its being very sparsely covered with trees, and in part largely denuded of timber. That answer was given to me.

2961. So that some kind of definition or general instructions for the work would seem to be very necessary if we want anything accurate?—That is precisely the reason why I have rather suggested to my Department that it would not be well to make a new return of woods until we had the advantage of an enquiry such as this to see if we could get any more accurate definition; but if we did, I do not expect it would enable us to get an absolutely accurate figure, although perhaps a better figure.

2962. It strikes me as being a very extraordinary thing that use is not made of the maps of the Ordnance Survey as the basis of these returns?—The Ordnance Survey contains an immense amount of information which might be of value on the matter. But neither the 6-inch nor the 25-inch survey could be in the hands of each of the 1,200 officers who collect our returns, and certainly not in the possession of the half million of persons who fill up the schedules. That, of course, is a practical difficulty. There have been a great many suggestions for definitions of what woodland districts ought to include, and the matter has been under the consideration of the International Statistical Institute, and we had a paper read last year at Buda Pesth by one of the Hungarian officials on "International Statistics of Woodland," which may give some help towards future work. They have gone into this in much more detail in foreign countries, and I could put these suggestions in if desired.

2963. It has struck me whether it would not be desirable to ascertain how the information is recorded in other countries?—We do in the agricultural returns make a statement of total forest areas for such countries as we can obtain the information from. As you are no doubt very well aware, in different countries the methods of obtaining these figures differ very largely: there are differences between the German and the Hungarian, and between the Swiss and the Swedish systems. In some cases areas are included which we would not call wood at all, but very small scrub.

2964. I know that in the returns of the wooded area in France they make an estimate of the area that would be covered by hedgerow trees and isolated trees if such trees were assembled together?—Foreign statistics differ very much, and therefore they are not strictly comparable. I have seen a good deal of several of these Continental forests, and we have had some discussion on this point, and a Committee of the International

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Institute goes into these matters; but the improvement of returns proceeds very slowly.

2965. (*Mr. Lewis.*) I believe in France they spend very large sums upon their Cadastral Survey?—I believe they do.

2966. The main difficulty, I understand, with regard to compiling the returns as to the area of land under wood in this country from the Ordnance Survey is that that survey is continually going on in different parts of the country, that the maps are published at different times; that there may be an interval of many years between the publication of, say, the maps relating to one county and the maps relating to another county, and that therefore in any given year it is impossible to have a general, comprehensive, and accurate survey of the country as a whole with regard to the area of its woodlands?—That is so; it cannot be synchronous. There may be a difference of 30 years between one of these maps and another.

2967. With regard to the amounts which are devoted to agricultural education, are you absolutely limited to the sum of £8,000 for any one year?—In every year the amount is necessarily inserted in the estimates of the Department.

2968. That amount for several years past has been fixed at £8,000?—I think not. Almost every year of late there has been a slight change. Some years ago, when a fixed sum of £5,000 originally was fixed, it went on for several years. But at the present moment there is just the same amount of fixture as in any other item in the estimates, no more and no less.

2969. Does it depend to some extent on the application made from time to time for help?—It would depend very much, not upon the applications, but upon the cases where, after application has been made, necessary and deserving work has been found. We have had applications which necessarily caused us to enlarge our demands on the Treasury, with whom, of course, it is necessary to reckon.

2970. Have you had many applications for help for instruction in forestry with which you have been unable to comply for want of funds?—I do not think we have had many applications of that nature which I can call to mind, and entertainable on other grounds with sufficient local support, where they have been absolutely refused on the ground of want of means.

2971. Have you had any such applications?—Speaking from memory—my colleague, Dr. Somerville, has a more recent experience than I have—we have, of course, on frequent occasions had general applications that more money should be spent on forestry; and we have considered these in giving grants to the institutions which teach forestry, up to the maximum figure given to an institution. It would not be in the practice of the Board to go beyond that maximum for a particular subject. That would alter the whole system. If you are referring now to forestry by itself, I think I may say we have never had to give a grant specifically for forestry instruction in England by itself, but such instruction must be taken into account as part of the general scheme.

2972. Supposing an application was made on the part of the University Colleges, and that application were backed with promises of local support, I presume the Board of Agriculture would be in a position to seriously entertain an application of that kind?—They would no doubt most seriously consider any application made to them, not only in the light of local support, but also in the light of the demand, the number of pupils likely to be forthcoming, and the sufficiency of the arrangements proposed. They would be unwilling to add to a grant of a general nature one for a single course of instruction for which there is no local demand. Nothing has been more disappointing to the Board than the number of pupils in different parts of the country forthcoming to take advantage of the provision made for agricultural education, and this is true very specifically in forestry. The number attending special forestry classes is peculiarly small; therefore the Board, before entertaining an application, would have seriously to consider whether it is likely to be of use to a sufficiently large number of persons to justify an expenditure of public money.

2973. Comparing the number of students in this country with those in other countries. I presume the percentage in the United Kingdom would be extremely small?—I am not quite in a position to speak with regard to other countries generally, but compared with certain countries it would be so.

2974. It shows it is necessary to do something to create an active interest in the work of forestry?—That has to some extent been acknowledged, but the work of teaching forestry rather depends on the question of what is the object for which people are coming to learn forestry. At present there is no great avocation in this country to be so reached, and little opportunity for the practice in any remunerative way of forestry as a profession.

2975. (*Professor Campbell.*) I have been exceedingly interested in what you have said with regard to loans, and I think most of the questions I wished to ask have been already put. Do you happen, in your experience, to know of any system of loans for planting in other countries?—I am not aware of any system myself, because the large forests of which I know anything in other countries are practically State forests, and therefore the question does not arise.

2976. You are not in a position to give us your views with regard to State forests in this country?—No, that would belong to another Department as matters now stand.

2977. During the last ten or twelve years there has been a very great increase in the demand for agricultural education, has there not?—Certainly.

2978. And a large number of farmers have benefited by such education?—Undoubtedly.

2979. Apart from the class instruction and apart from their actually having taken part in demonstrations, farmers have been indirectly benefited thereby?—Yes.

2980. That has been largely due to the general interest which has been created?—Yes.

2981. People have read more, and so on?—Yes.

2982. I suppose you are of opinion, in the same way, that if more attention were devoted to forestry, we should have much more attention paid to our woods and forests?—I should hope that would be so.

2983. In fact, the experience of the last twelve years distinctly points to the fact that there would be?—I think so; there is, no doubt, room for creating more interest in what we might call not necessarily forestry, at all events woodland, management in this country.

2984. We could look forward with considerable confidence to an increase in planting if there were some better means provided for forestry education in this country?—That is not quite so certain, for it must be remembered that a good deal of the increase of interest in agricultural education, at all events at first, as regards pupils attending classes, has been caused by the creation of new teaching avocations, which has helped to draw pupils who wish to be employed as teachers all over the country, and you have not anything of the kind as regards forestry. There is no such avocation in forestry corresponding to the local lectureships for general agricultural teaching under the counties, and the posts where knowledge of woodland management are wanted are usually land agencies of a general character.

2985. Yes, but it must be within your knowledge that there was a considerable amount of prejudice against agricultural education ten or twelve years ago, and that has broken down to a great extent?—I hope it has been broken down. There has been at least a great advance.

2986. I am myself of opinion that in a similar way we could very largely increase our interest in woodlands if we had a system of forest education, and, I merely wish to know whether you share my opinion in that?—I am quite sure if we could assist in any way in diffusing more general instruction in forestry to those concerned in land management, it would be what the Board would desire to do, if a feasible scheme were devised.

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Dr. WILLIAM SOMERVILLE (a Member of the Committee), called; and Examined.

2987. (*Chairman.*) You are President of the English Arboricultural Society?—Yes.

2988. And you have pursued your forestry studies on the Continent, and published your views upon the subject, and on many interesting subjects connected with forestry?—Yes, I have.

2989. You have been, for a long time, in close contact with many of the practical foresters of the country, I believe?—Yes, I have met most of them.

2990. Could you give us your views as to what you think is wanted to maintain forestry in the United Kingdom?—I am in complete sympathy with the scheme

that has been sketched by Colonel Bailey, and with the system which has been advocated by Dr. Schlich. I think that the educational systems that they recommend will, so far as they go, practically meet the case, and I have no doubt that ultimately, when they are completely developed, they will leave nothing to be desired. But, of course, at present we are more or less in the initial stages of the movement, and it is often necessary to do some pioneer work before the matured schemes are complete. And I think there are perhaps a few other directions in which something might be done that have not been touched upon so far. For example, the system of local lectures and local instruction generally for foresters, I am sure, has certain advantages, although it cannot be offered as a substitute for the more elaborate schemes that some of us have in our minds. Colonel Bailey has already told us of a successful course of lectures—a very short course, it is true—which he gave in Aberdeenshire, and I have had some experience of the same system in the north of England. Within the limits of this particular development, I am sure that a certain amount of good is very readily done to a locality. One gets the foresters of the neighbourhood to come in to a weekly class during the less busy months of the year, and if such classroom instruction is combined with occasional visits on Saturday afternoons to the woods in the neighbourhood, the foresters are certainly placed in possession of some ideas and information which they would not otherwise have acquired. And such lectures, I think, might very well form feeders, as it were, for a more elaborate and more complete system. You stimulate interest through these lectures, and you complete the educational process by means of more complicated and more perfect machinery.

2991. I suppose those lectures to which you refer were attended almost entirely by working foresters?—Yes, I should say entirely by working foresters. In the case of the course at Hexham, which ran through two winters, I think the audience comprised the young men who were employed during the day in the extensive nurseries which are met with in that district, and foresters on the estates in the neighbourhood also came in on one evening in the week. But, as you have said, they were chiefly working foresters. That idea, it seems to me, is capable of considerable development. From my own observation, I am sure that some of the men, at any rate, who came within the influence of such instruction were considerably benefited by it; and as a matter of fact if they had not got that they would not have had anything at all. Because, however desirable it may be that the rising generation of foresters should pass through a properly equipped forestry school, the fact remains that only a very small proportion, I think, of those in the country will, for some time at any rate, receive benefit from such instruction. Then the same idea was carried out in another way, where the Northumberland and Durham County Councils gave scholarships sufficiently large to cover the expenses of travelling to Newcastle on one day in the week during a whole winter, and in place of the instruction being given at a local centre, as at Hexham, they came into the college at Newcastle, where, of course, we had a better equipment in the way of specimens and diagrams, and to some extent, microscopes. They then got instruction there and returned to their homes in the evenings. I do not think I have any very strong views as to whether one system or the other is the better. Sometimes it might be convenient to have one of these forms of instruction, and at other times it might be well to have another; but at all events, the instruction which was given was thoroughly appreciated, because we had very large numbers indeed, both at the local lectures in Hexham, and to the evening lectures in Newcastle.

2992. One might regard these lectures perhaps as a sort of primary system of instruction for the foresters over the whole country?—Yes, I think that now, with so many collegiate centres established throughout England and Scotland, a good deal more might be done in that direction than has been done. There are many centres which are obviously suited for the purpose, such as Perth, Inverness, and Aberdeen in Scotland, and certain districts in England which are well wooded might, I think, be brought under some such system as that, as a preliminary step, but not as a substitute for the larger schemes which have already been discussed. And then the County Councils, it seems to me, can do a great deal in the way of establishing demonstration plantations upon the experimental farms which a great many of them have started now. You have experimental farms in such places, for instance, as the West of Scotland, Newcastle, Leeds, Lancashire, Cheshire, Nottingham, Cambridge and Wye, and possibly other places, and although these farms are designed primarily for demonstrations in agriculture, there is no reason why, I think, in most cases a small area, say anything from 10 acres upwards, might not be placed under demonstration plantations to show what is meant by different systems of mixing, and different systems of planting, and different systems of management. With your permission I shall hand in some photographs of some such demonstration plantations which were formed on the experimental farm of the Northumberland County Council. These were started in 1898, that is to say, they show four years' growth at the present time, and in a very few years I hope that they will supply some really useful object lessons. Not only do they supply object lessons in sylviculture, but they also give information as to the suitability of certain trees to the locality. Take as an example the Sitka spruce, which does exceedingly well in some localities, but we find in Northumberland that the results so far are scarcely successful.

2993. You find that the County Council areas are valuable for local lectures, just in the same way that a school forest is valuable attached to a forest school or university?—Yes, I think the analogy is complete.

2994. Besides the system of local lectures in Northumberland, and the County Council plots which you arranged there, you have had some experience also of University teaching?—Yes, both in Newcastle and also in Cambridge. I gave lectures on forestry at both Cambridge and Newcastle. The College at Newcastle is part of the University of Durham, and the agricultural students which we got there were prospective farmers and prospective agricultural teachers, and not so much prospective landlords. But forestry was part of the curriculum, and is part of the examination for the degree of Bachelor of Science in the Department of Agriculture in the University of Durham. In Cambridge lectures on forestry have been given since the Agricultural Department was started there, but the subject does not form part of the degree course, it is a purely voluntary subject, and when a subject is purely voluntary and leads up to no examination, one may be quite sure that those who attend the classes are really interested in the subject, and find that they are deriving some benefit from the study. I should say that the numbers attending such a class are a much better test of the value of the subject than in the case of a course of lectures which qualify for a degree, we will say; and measured by this standard, we found the lectures at Cambridge were very much appreciated indeed. The class in forestry was scarcely less in size than that on agriculture; it attracted all sorts of people, and bursars of colleges who were of course managers of land in some cases attended the lectures, and the undergraduates who had a prospect of coming into landed estates in some cases have come to them. Altogether I think there was a very considerable amount of enthusiasm about the lectures on forestry there, and if it had been a subject which was compulsory for a degree the numbers would have been considerably greater than they were.

2995. Did your Cambridge classes get the attendance of the landowning class?—Yes, very largely, I think. The audience was largely composed of those who either owned land or were likely to own it, or who were qualifying as estate agents.

2996. At Hexham you found yourself carrying on your educational system at the elementary stage, that is to say, amongst the working foresters?—Yes.

2997. At Newcastle you were dealing largely with occupiers of land and estate managers, and at Cambridge with men who were likely to own land and also manage it?—Yes, I think that is a fair classification.

2998. What do you think is the most pressing requirement?—I quite agree with the witnesses who say that the education of the landlord is the most pressing requirement before very great improvement can be effected. Until landlords can be convinced that forestry can do a great deal more than they believe at present can be done to develop the estate financially, I do not think we shall have a very great extension of sylviculture. So I think it is of the highest importance that opportunities should be given to the prospective landowners to acquire some knowledge of the subject, and that of course can only be done effectively, I think, through providing instruction in forestry at the centres

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of education to which the young landowners resort—that is to say, Cambridge and Oxford, for the most part.

2999. Have you any views as to the most pressing requirements to attract that class?—I think the student will be attracted if the instruction is offered to him. We shall only at the most, of course, get a small proportion of the total number, but the best of them are always quite ready to come to instruction in forestry. It is a subject which appears to appeal to them more than many other subjects do.

3000. With your experience of Cambridge, do you think it a good centre?—It is an extremely good centre from the point of view of getting the kind of man you want, but it is not a good centre from the purely forestry point of view; there are very few woods in the neighbourhood of Cambridge, and therefore we had not many facilities for demonstrating on the ground what we wanted to teach them.

3001. Would the class of student that is likely to study at Cambridge take part in tours abroad, to the Continent?—Yes. Of course he is very much inclined to join what is called a reading class, and I myself did take a small party across to Germany last year, and I am sure that that idea might be very considerably developed.

3002. You believe, I suppose, that there might be a considerable and profitable extension of the timber-growing area of this country?—Yes, I think a very considerable extension might be made with profit.

3003. And, apart from private ownership, do you think there is much field open to the State to encourage or to undertake commercial forestry?—I am afraid I could hardly give an opinion that would be of any value on that particular point.

3004. You would concentrate your efforts on training the private owner?—I should concentrate my attention, I think, on stimulating interest amongst private owners, and endeavouring to effect an improvement in that way, just as one does in agriculture, through the agency of the private owner.

3005. (*Mr. Stafford Howard.*) Can you give the Committee any idea as to the number of pupils you had attending, in the first place, the Hexham lectures?—I have not the figures by me, but somewhere between 20 and 30.

3006. And that is a district where there are large nurseries, and therefore there is a number of men specially interested in the subject?—Undoubtedly it is a favourable centre.

3007. You would not find the same thing in any ordinary agricultural district?—No; localities would require to be selected with very great care.

3008. With regard to the lectures in Newcastle, about what number attended them?—Very much the same number.

3009. How many of them came in with scholarships?—They all came in with scholarships that attended the evening classes in forestry.

3010. So they all came from outside?—Yes; these were special classes organised by the adjoining County Councils. Beyond these there was the regular day work in agriculture, classes attended by the men who were putting in a three years' course at the University, and the numbers in that case were less.

3011. Those were students at the University?—Yes, at the College of Science.

3012. The evening lectures were attended only by those who came in with the scholarship money?—Yes.

3013. Did they come any distance?—In some cases more than an hour by train.

3014. So they would be able to get back the same night?—Yes.

3015. There is no reason, I suppose, why the other County Councils should not do the same thing if they thought it was worth while?—There is really no reason at all why they should not.

3016. And as some of them are spending a good deal of money on agricultural demonstration farms, you think they might add forestry to that in some cases?—I think they would be quite willing to add forestry to it if they could get the instructors. In my case it was largely a personal matter. I suggested things to them, and they were good enough to adopt my suggestions.

3017. That is the only place; that is to say, Durham and Northumberland are the only counties which have given scholarships for this purpose?—So far as I know, they are.

3018. At Cambridge what sort of numbers attended the lectures there?—I think the class there ran from 12 to 15, which does not appear to be a very great number, but when one considers that they persistently attended during the three terms which constitute the year, I think it is quite a satisfactory number.

3019. Were these lectures given as an ordinary part of instruction at the University?—Yes, as part of the instruction at the University.

3020. Not as an outside subject?—No.

3021. Is that continued still?—I really cannot say whether my successor there has carried on the work or not.

3022. You carried it on for three years?—I did really more than that; I must have given lectures there for four years, at any rate.

3023. And you found a difficulty there from not having any practical instruction area within your reach?—Of course an area for instruction within a convenient distance would have been very useful indeed, and enormously important.

3024. Did you ever visit any of the adjoining properties on which there are woods?—Yes, we had to do that; but Cambridge is badly situated for getting at any woods within easy reach which are worth going to.

3025. (*Professor Campbell.*) You have taken a very great interest in agricultural education, I believe, Dr. Somerville?—Yes.

3026. You were one of the pioneers of that work. Do you find that as the result of the work which has been undertaken in the last 10 years a great amount of prejudice has been laid, and that now there is a great interest in the subject compared with what there was formerly?—Yes.

3027. What I personally believe, and I want to know whether you agree with me, is that if the same were done with forestry you would have the same results. Do you think that is so?—In the case of forestry we have no prejudice, to begin with. The British forester is a man who is prepared to receive instruction without any attempt to pick faults with it; he will receive the teaching without criticising it.

3028. Is that very general?—According to my experience the British forester is keen for instruction, and looks with no suspicion upon it.

3029. Still, there is a lack of interest amongst landowners, is there not?—Well, I do not know.

3030. There is a lack of interest on the matter in this country?—There is a lack of interest in a way, certainly.

3031. But would you attribute a great part of the present state of sylviculture in this country to lack of interest?—Yes, but it is really a lack of knowledge. Landowners in many cases have no idea of the possibilities of improvement. But when the possibilities are pointed out to them they appreciate them in many cases readily enough. But in many cases people simply believe that trees are planted, and that afterwards they come, somehow or other, to fellable age, and that there is no opportunity of influencing the development by management. The want of improvement in the past has been due to ignorance rather than to prejudice.

3032. Ignorance on the part of the forester?—No; ignorance on the part of the landowner.

3033. But, as a rule, if the landowner's interest was aroused, he would soon give his forester better facilities for education?—No doubt he would appreciate it.

3034. I believe that this is largely a matter of stimulating interest, and I want to know whether you agree with me. My experience in agriculture is that progress has not been so much due to direct instruction, but indirectly to increased interest, which has led people to read and think?—But in the case of forestry we start from an entirely different standpoint.

3035. You think the analogy does not hold?—In agriculture I think the English might be said to have been as far advanced in agricultural practice as any in the world 10 or 12 years ago, when this educational development started. In the case of forestry, when you start education in England you start from an abso-

lutely different plane. We may say that no forestry in all the world is so bad as English forestry.

3036. Do you think landlords realise that fact in this country?—They do not realise, I daresay, in many cases, what the condition of things is, and that it is as bad as it is; but a great many of them realise that improvements are possible, and we see most gratifying evidences of its appreciation in many directions.

3037. And that needs to be spread?—Yes, and it is spreading.

3038. I have asked the question once or twice of other witnesses, whether the providing of experts who would visit forests and give advice to landowners or to foresters would be an advantage. What do you say?—There are such experts now, you know, and they are utilised to a certain extent.

3039. Do you think that a large extension of that system would be an advantage?—I think it is the only possible way of effecting improvement in the case of small areas and small owners.

3040. And that there is urgent need for a number of instructors of that kind?—It is very desirable that there should be such facilities.

3041. You agree in the main with what has been said so far with regard to forest schools and model forests, I take it?—I agree entirely, I think, with what has been said on that matter.

3042. Have you, by any chance, prepared anything which you can give us now with regard to the course of study which you recommend? Or is that a matter which has not been worked out by you yet?—I have not an elaborate scheme prepared, but there is very little room for diversity of opinion on the matter. I think probably we should not have any difficulty in arriving at a thoroughly useful course of instruction.

3043. For example, with regard to the difference between instruction suited to foresters and that provided at college for landowners and agents, would you be in favour of supplying a substantial course to the working foresters at the forest school? Would you say we should have class-rooms attached to the forest school, and courses of instruction given there?—You must, I think, have a certain system of instruction, of course. The forester wants instruction more particularly in regard to the diseases of trees, so that he may readily recognise diseases when he sees them, and be able to nip them in the bud. He must have a knowledge of entomology, because the working forester is a man who is amongst trees, and he is able to see whether any injurious insects become very abundant or not. And then he ought to know the general principles of tree growth and the structure of wood. And as regards out-of-door work, he must receive instruction in the very best method of planting and felling, and so on. But the landowner, of course, ought to be instructed rather in the economics of the subject, such as in the question of rotations, the length of rotations, and the financial aspects in a broad general way, rather than in matters of detail.

3044. But still, you would advocate a course of scientific instruction at the same time?—Yes, to a certain extent, certainly.

3045. I suppose you are not prepared to give us any suggestion with regard to the cost of any of these schemes, because that is a point which is scarcely before us?—I think something like £600 or £700 a year in the case of the forest school. Of course, the instruction in the universities, which would come later, would depend upon the salaries which one is prepared to give to the lecturer or professor, as the case may be. I should say that a forestry school could be very well run by two special men. One of those would be the director of the school, and would perhaps instruct in sylviculture, broadly speaking, including forest mensuration; and the other one would be the junior, who would take the natural science subjects—botany and zoology, and so on. These two men, then, between them, would give all the instruction which it is necessary to give to the working forester who would come to the school. And the salaries of these men, as I say, could be put down, I think, at £600 or £700 a year for the two. The man who took natural science would be prepared and able to carry through some research work on the growth of trees; and perhaps the other man might also be able to find time to do some experimental work, too.

3046. That would be the annual expenditure? Of course, there would be a certain cost over and above that of acquiring a forest school; and in that connection I want to have your opinion with regard to whether you would work this forest area entirely for profit?—I agree absolutely with what Colonel Bailey said, that the ultimate test of the success of a forest area must be financial success. If it is a failure financially it is an absolute failure in every way.

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3047. Do you apply those remarks to a demonstration farm?—The two things are not strictly comparable. I regard the experimental farm as an open-air laboratory. But in the case of a model forest, so-called, a very small portion of it indeed would be under strict experiment or demonstration; the rest of it would be run purely upon financial lines. But a certain amount of it would certainly have to give results other than financial results. Trees might have to be cut down before they were ripe; they might have to be artificially infected with disease even. So that a certain portion of the area could not be expected to be run as a financial success.

3048. Such areas might have to be planted with trees unsuitable for the district?—Yes, within limits. One might have to put in something which one was not quite sure about.

3049. (*Mr. J. H. Lewis.*) You speak of the admirable work which has been done by the establishments of the Northumberland and Durham County Councils. Is there any special reason why those should have taken up the question?—No reason, except that I was there and stimulated them in that direction.

3050. It would be possible, I take it, for other counties in different parts of the country to take up the work in the same way?—Yes, quite, if they can get the men.

3051. It is, I suppose, very desirable that in our County Councils there should be one or two men who take an interest, I might say who feel an enthusiastic interest in the question, which would help it on very materially, I presume?—Yes. I think if there were such men the teachers would be obtained. But the number of men who are qualified to give instruction in forestry is very limited.

3052. At the present time you mean?—Yes, very limited indeed.

3053. Do you think it will be so for some time to come, or are there signs of improvement in that direction?—Yes, there is improvement. Even now, compared with ten years ago, the position is very much better. There are a certain number of men capable of giving this instruction. They have learnt a good deal in this country and then have gone on to the Continent; they have gone across and come back again. They are perfectly well qualified to give thoroughly reliable instruction, but they are not being utilised to any great extent.

3054. With regard to the local students you had at Hexham and at Cambridge, do you think that not only is good done to them by the instruction which they receive, but that indirectly a great deal of good may be done by the interest they are able to arouse in others, and by the information they are able to impart?—I think there is no doubt that the enthusiasm radiates from them when they get back into their situations again.

3055. What area do you think an experimental farm plantation should consist of under the management of the County Council in connection with agricultural farms?—Well, it is difficult to get an idea of that, because these experimental farms are put down on land which is not forest land. I do not think they would need much land, say 10 to 20 acres of land, which one cannot say is essentially forest land, for the purpose of putting down these demonstration plantations. I should like to see something like 100 to 120 acres, if suitable land could be obtained. But you can do a great deal with even 20 acres.

3056. Do you think it would help if the University authorities in centres where forestry instruction is given would recognise the lectures and the examinations which would be consequent upon the lectures as giving the students a certain amount of credit, which would help him in taking a degree, or which would be of assistance to him in one of the other schools?—They allow the student to select forestry for a degree in Edinburgh now. The subject is a compulsory one in the University of Durham for the degree of Bachelor of Science in Agriculture.

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3057. That is not the case at Cambridge?—No, that is not so in Cambridge, and I did not see my way to urge it. The subject was only recently started there, and there were other subjects which had a prior claim, it seemed to me. And it does not at present count as a subject for the degree. But it is only a question of time. It will eventually be brought in, I have no doubt.

3058. If it were brought in I have no doubt it would encourage the study of forestry?—It must necessarily do so.

3059. But naturally University men who have only a limited time to spend there look to the subjects which it will pay them to follow up?—Clearly.

3060. Are there any suitable text-books, books in a clear and simple form, which could be easily understood by foresters who are unable to attend the lectures? One would, I suppose, make a complaint of the dearth of text-books of that character?—The amount of forestry literature in this country is not great. There are some very first-class manuals, but they are perhaps rather beyond the reach of the ordinary working forester. Very valuable articles appear in the Transactions of the two Arboricultural Societies.

3061. The ordinary forester has not access to these Transactions, has he?—Yes, there are large numbers who have, and the two societies allow foresters in at reduced rates.

3062. Do you think it would be an advantage if information of that kind were given in a small and permanent form to foresters who could not afford to attend the classes?—I clearly see the benefit of having such a book. Indeed I would not like to say positively such a book does not exist at the present time. I do not recollect one which one could call a primer of forestry or an elementary text-book on the subject, unless there is one in America.

3063. Do you agree with other witnesses that there are considerable areas of land in different parts of the country that could be profitably afforested, but which are not at present under wood?—Yes, I am clearly of opinion that that should be done.

3064. Do you think it would be an advantage if a small expert committee were appointed for the purpose of ascertaining more clearly and definitely where there are such areas, and the extent to which they might be planted?—I think that such information would be of very great value.

3065. With the view of possible State action in the future?—It would be very desirable indeed that a more clear and more authoritative statement should be obtained as regards the areas which are likely to be suitable. We know the areas which are not at present under trees, but we do not know what proportion of this area may be suitable for tree planting. I think such a committee would be very usefully employed.

3066. (*Dr. Schlich.*) I shall not have very much to ask you, for two reasons; first, because you have already been examined upon a variety of subjects; and, secondly, because you have declared that you are in agreement with the proposals put forward by Colonel Bailey as regards Scotland, and by myself as regards England. But there are one or two questions I should like to put with the view of eliciting additional information. The first is, what is the extent of the forestry instruction which you used to give at the Durham College of Science?—I tried to give a review of the whole subject, what the Germans call "encyclopædie."

3067. Consisting of about how many lectures in the lecture-room?—About thirty hours' instruction.

3068. And was that accompanied by any excursions or not?—It was accompanied by a certain number of excursions.

3069. You had not any great means of instruction in field work near Durham?—Yes, we were rather well off in that respect there. We found a much greater difficulty in Cambridge.

3070. I must ask you the same question about Cambridge, about the extent of your lectures at Cambridge. Did you give them to about the same extent as at Durham?—The course at Cambridge ran to more. In this way, that whereas at Durham I used to give instruction in forest botany and forest entomology, at Cambridge I was relieved of these two subjects. One was taken by Professor Marshall Ward, and the other by Mr. Warburton, the University lecturer in entomology. So although I continued to give 30 hours' instruction, as I was relieved of those two subjects, the course was more complete.

3071. In other words, you gave your instruction in Cambridge to rather more advanced men?—Yes, I think so.

3072. What is your idea with regard to the educational facilities provided at Oxford and Cambridge? What was the extent of that instruction? Or I will put it in another way. You are counting at Oxford or Cambridge on a number of owners of land, and first class or superior land agents?—Yes; that is the class.

3073. What do you think, from your knowledge of the arrangements at Cambridge, would be a sufficient amount of instruction to students of that class?—Well, we have to remember that these men are burdened by other subjects, and one cannot indicate what one would like, so much as what one can get.

3074. Precisely?—I should say that under existing circumstances the case would be met by something like a 50-hour instruction course annually in forestry, in its more restricted sense. The students get instruction in botany and geology and chemistry, and all such subjects, outside of any possible lectureship in forestry. I think probably, to begin with, that would be sufficient. In fact if one were to make the course too elaborate one would deter some from entering.

3075. One other matter I would like to clear up. Do you not think that we ought to strive to obtain, at any rate at one of the Universities, rather a more complete education in forestry, with the view of meeting the case of those who want to devote themselves specially to forestry, whether they work in this country, or go to the Colonies, or, might be, go to India?—My view is that men who want to specialise to that extent ought to go to Coopers Hill.

3076. With regard to the men available for instruction under the County Councils, if we were to introduce a more extended system of instructing through the agency of County Councils, we should require a considerable number of instructors?—Yes, one would require a considerable number, but I should not think of attaching an instructor permanently to any one County Council, or to any small group of County Councils. The County Councils might employ qualified instructors, who might of course be in one part of the country at one season and in another part at another season.

3077. And that might fit in, or it might not? It might be desirable in many cases that the instruction in different counties, or in different places in the county, should be given at the same time, that is, when it is most convenient for the men who are to attend it. I do not say it would be so. And then the number of counties is very considerable. What I want to know is, do you not think there is room for the education of a sufficient number of competent men as instructors under the agency of the County Councils, and ought we not to take into consideration that fact in devising means for instruction in forestry at what I may call headquarters?—You mean that the preparation of teachers should be an important item?

3078. Yes?—I do not think that the number of teachers who would be wanted in this country can ever be great, and especially so if we are going to concentrate our efforts ultimately on two or three forest schools. But, of course, the instructors who take agriculture or rural economy as a general subject ought to have some knowledge of forestry also, as being a portion of estate management.

3079. As to the development of means of instruction at Cambridge, I think you could tell us something about the land available, either for a forest-garden of some considerable size, or if necessary afterwards, for a small school forest. I think possibly you might be able to tell us something about the land available, and the ordinary rates at which such land is nowadays let within a reasonable distance of Cambridge? Have not some of the colleges considerable areas of land?—The colleges, of course, have large estates, and to some extent these estates lie near Cambridge. There is no considerable area of wood on any of them which I am acquainted with.

3080. It is perhaps agricultural or pastural land now. Could that be made available?—There is plenty of land which one would call suitable forest land, the rent of which for agricultural purposes in many cases is no more than 5s. an acre.

3081. That is what I want to know. A fairly large area could, if necessary, be made available, you think?—I think so, but there is a great difficulty about the extension of forestry in the East of England, and that

is through the tithe, which is high in Cambridgeshire and Essex; in many cases it is 4s., and sometimes 5s., an acre.

3082. You mean if it is to be forest?—No, at present the land is loaded with tithe to the extent of 4s. or 5s. an acre; and that tithe will, of course, remain.

3083. That would be in addition to the rent?—Yes, in many cases it is.

3084. And that would bring it up to 9s. or 10s. an acre?—That is so in many cases.

3085. Even on 300 acres that would involve in the shape of rent £130 to £140 a year?—You could get plenty of land for that.

3086. I want to ask you another question, based upon your experience, and we know you have had a considerable amount of experience. Do you think that the damage done to forests, generally speaking, by diseases such as fungi, or the damage done by insects, is the greater? I mean which damage is the greater of the two, looking at the matter all round?—If we exclude larch disease, there is no difficulty at all about answering your question.

3087. And the answer is?—The answer is insects; these do far more damage than fungi do.

3088. Far more?—Yes, far.

3089. You know as well as I do that in continental forests they say that for every tree that is ruined by a fungus there are perhaps five or ten trees which are ruined by insects. We need not go to quite that proportion, but you are satisfied that the damage done by insects in the long run is by far the greater?—I think so.

3090. Consequently the importance of the study of entomology would not be inferior to that of the study of fungoid diseases, for the working forester, and perhaps might be of more importance?—Quite as important, yes.

3091. Perhaps you will be good enough to tell the Committee one thing more. So far as our knowledge goes at present—and it is not by any means a closed book—what would you say was about the number of fungi which are really actually dangerous at present to forest growths? I mean those which really come into consideration from the point of view of managing a forest?—I suppose something under half-a-dozen.

3092. And at what number would you put the injurious forest insects—I mean those of the first order, corresponding to your half dozen fungi? Somewhere about the number 100 or 50?—It is very difficult to say.

3093. It is a multiple?—No, it is not very much of a multiple. I should not think the number of species is very much greater than half-a-dozen.

3094. Do you mean of forest insects?—Yes. The number of species of forest insects which do serious damage to trees does not seem to me to be much beyond half-a-dozen; but the aggregate damage which is done by these insects is very much greater than the aggregate damage which is done by the half-dozen important forest fungi.

3095. I am surprised you have put it so small. I was prepared to hear you say fifty or lower, but I am surprised to hear you put it as low as six?—We might pursue the matter a little further, and I might name them.

3096. Can you do that?—My point is that a very large number of extremely interesting forest insects do not attack healthy trees, and do not attack living trees, and if you confine yourself to insects which attack healthy, living trees, the number of them is not a very large one.

3097. I am satisfied with the answer which you have given me?—I think, speaking about fungi, that the most unsatisfactory thing about diseases of trees is that those caused by fungi are such that one can do very little to stop them; but in the case of damage caused by insects one can do a great deal to combat it.

3098. I intended to ask you that question. You say you can do a great deal to prevent the extension of insect damage, and far more readily than you can the damage caused by fungi?—Yes.

3099. (*Colonel Bailey.*) In connection with the County Council lectures, which I am interested in myself, because I have just come from attempting to give such a course, I would like to ask you one or two questions. If I understand you aright, you suggest a course of some twenty-five to fifty lectures?—I think a very suitable number would be one lecture a week for about twenty winter weeks, and that would be twenty lectures.

3100. At what time in the day were the lectures given, of which you speak?—They were given in the evenings. That is the only time at which you can get the working forester into a class.

3101. I think you said the instruction was combined with excursions?—Yes.

3102. When were they held?—On Saturdays.

3103. In the afternoons?—Yes, afternoons for the most part.

3104. You say the attendance at the classes at Hexham was about twenty or thirty?—Yes.

3105. And you have there, I understand, a large number of nurserymen, owing to the presence at Hexham of considerable nurseries?—Yes.

3106. You mentioned the possibilities of having such lectures at Perth, Aberdeen, and Inverness. Do you think that you would be able to assemble at those places the class of men that you want for such a course as you have been speaking of? I mean the working foresters? I ask this question because it is a difficulty which one has to face, and I do not see my way out of it. You may have an audience, but are they the right sort of men?—I agree that in some cases that may be; but in my experience only a small proportion were not working foresters.

3107. From the nature of the foresters' duties they are people who are scattered about. They live probably in the most remote districts, and I have never been able to see my way to the assembling of a satisfactory number of the kind of persons that I want to get at. I gave a certain number of lectures at Torphins, and the room was fairly full of people, but I think that the people I wanted formed a very small proportion of the audience. Consequently the amount of good done by a course of lectures such as I have attempted to give must be relatively small. The course might certainly excite a certain amount of interest and give some useful general information to school children and others; but as to it being a serious attempt to deal with the education of the forester, I have considerable doubts, and I want to ask you whether you share those doubts?—A large number of foresters attempt, at some stage of their careers, to put in a year or two in a public nursery. I think that may be accepted as part of their training, as a rule. And those young men who come to such a place as Hexham or Inverness would naturally take advantage of the opportunities for scientific instruction which might be presented. In the neighbourhood of these places there are woods, and within a radius of ten miles or so there may be a considerable number of men engaged in the practice of forestry.

3108. So that the presence of a nursery would be a very important feature in the success of such classes?—Yes, because it attracts these young men.

3109. You think it would be an important feature?—Yes.

3110. But if you tried to give lectures in a place where there was no nursery you would not be likely to meet with so much success? There would be a great difference?—I think if there were no attraction of that kind your class must be very small.

3111. Would it not be very difficult, under these circumstances, to organise the peripatetic lectures which we have talked about? The lectures can only be delivered in the evening, and very probably, as Dr. Schlich has suggested, only at a certain time of the year. Would it be possible for a lecturer to go about lecturing one night a week? Could you find lecturers who would cover very much ground in that way? Would you not require a considerable number of lecturers?—The number of places which are suitable for such instruction would be very limited. Perhaps the number of suitable places in Scotland would be four or five, apart from Edinburgh, and there would be nothing to hinder one expert, or one forestry lecturer, dealing with three such places in a week.

3112. Then you do not contemplate the extension of this system all over the country? You say it would be only applicable to four or five places?—That is as regards local lectures. But with regard to other lectures, where you get men coming in from a radius of thirty miles, the matter might be different.

3113. I thought that was all one thing. I had not realised there were two?—Drawing from my own expe-

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rience, there is such a centre as Hexham, with forests and nurseries in the neighbourhood, and young men coming up to learn the business. Then there is the other case where we got men to come into Newcastle from the counties of Durham and Northumberland, as they would come into Edinburgh from eight or ten miles round, or any place which was accessible within two hours by train. And the County Councils in the North of England were giving scholarships of a value which covered the railway expenses of the pupils.

3114. Taking Scotland as a whole, could you give us an idea as to how many centres, in your view, should be established? Or how many centres do you think it might be possible to establish?—I think it would be desirable to see more instruction given in the University of Aberdeen; and I think, as regards permanent centres, that such centres in Edinburgh and Aberdeen would meet the case.

3115. Some, including myself, have held the view with regard to Scotland that it would be a mistake to begin by scattering our efforts; that we should begin with a well-equipped educational establishment in one centre, and then gradually develop as required by the evolution of things. What do you think about that?—I think that a considerable number of men are at present going through the agriculture course in the University of Aberdeen, and afterwards going out into the world as estate agents, and they are receiving there whatever scientific instruction they will ever get, and thus the one opportunity of giving them instruction in forestry has been neglected.

3116. You said that there were a considerable number of men, as I understood, who might be availed of for the purpose of giving instruction, and that these men had had courses of instruction in this country, and had afterwards gone to Germany?—Yes.

3117. But there are no schools in this country, except at Coopers Hill, at which such instruction is given?—There are a few who have been through it.

3118. I am myself conducting one of the largest courses of instruction outside Coopers Hill, but I do not claim that any man I could turn out from my class would be competent to teach?—I was careful to say that there were men who had gone through all the instruction which they could get in this country, neglecting Coopers Hill, and who had subsequently gone to the Continent, and had gone through a complete course of instruction there.

3119. Do you think that men who have merely gone through courses of instruction, but have not had practical experience, are competent to give instruction?—They are competent to give instruction which is of value, but not so much so as if they themselves had managed for, say, seven or eight years a large forest area.

3120. You mentioned the establishing of demonstration plantations in connection with agricultural classes, plantations of 10 or 20 acres. Who would look after those?—The Director of the Agricultural Department of the College who had charge of the farm.

3121. He would be an agriculturist, but would not necessarily know anything about forestry?—I do not suggest that these should be developed unless there were expert knowledge sufficient to do it.

3122. You need not necessarily rely upon the agricultural teacher for it?—No, not at all.

3123. I have only one more question, and that is with regard to the present salaries of foresters, which, I daresay you are ready to allow, are very low in proportion to the value of the interests committed to their charge?—Yes.

3124. Do you think that if the system of forest education which we have been talking about were developed that would in all probability lead to the realisation by the landowners of the value of their wooded property, and consequently to an improvement in the prospects of working foresters?—Yes, I think so.

3125. And you think that if that were so it would possibly lead in the future to their being taught at some of the higher educational institutions?—To some extent it would do so. Of course we must be very careful not to attempt to prove that foresters are going to get more salary, and that therefore the estate is going to be weighted with heavier charges. I would make this point: that probably in the future the forester may have greater responsibility placed upon him, and will probably therefore get a higher remuneration; but the money which is required to pay this improved salary would be saved in some other direction, or by some other department of the management of the estate.

3126. (*Sir John Rolleston.*) You agree that the principal person to be influenced as to the importance of increased attention to forestry is the landowner?—Yes, I think so.

3127. He is the first person to be thought of?—If one had only to attend to one section of the community I should begin with the landowner.

3128. You think, from your experience, that forestry is a subject which does appeal to young men who are prospective landowners in the position of undergraduates at the Universities?—Yes, I am quite clear upon that point.

3129. And that better opportunities for instruction would produce that increased interest which is desirable?—Judging from my own experience, one can always get an audience if one can provide the subject.

3130. On very poor land it pays better to produce timber than food?—On very poor land, yes; better than farm crops.

3131. Timber production must be on a large scale; there is no room for a small holder in the production of timber, is there?—Not for a very small holder.

3132. With regard to damage caused by insects, is that damage increased, do you think, by bird destruction?—I cannot say that I have formed any clear opinion on that subject. But I am not aware that the destruction of bird life has materially increased the damage caused by insects.

3133. (*Mr. Marshall.*) You have touched in your evidence upon the question of attracting students to the classes—that is to say, the working forester class. I should like to ask you how you propose to induce the County Councils to give facilities?—The County Councils, in my experience, have been always very ready to give opportunities for instruction if instruction is called for.

3134. Of any sort? Do you think they would take forestry in?—Yes, I think so, if there were a demand for it, just as they teach carpentry, and so forth. If the County Councils were asked for instruction in forestry I think they would no doubt cast about to provide instruction in it, just as they do also in horticulture.

3135. You do not think they would need much persuasion to do that? I gather much was done in forestry in the north of England simply because you were there to advocate the claims of it. Do you think the County Councils would want an equal amount of persuasion all over England? I am talking particularly of the south of England, where foresters are certainly twenty times as ignorant as your people are in the north of England; there are a few Scotch people who know something about it, but there are very few in the south who know anything about it, and consequently they are absolutely in need of more education by a primary course than other people are. Do you think that County Councils all over England would be prepared to take it up?—Nearly every county in England is now in contact with a collegiate centre. In the south of England there is Reading, which covers a large number of counties in this respect; and if the contributing counties to Reading were to demand that the Agricultural Department at Reading should provide a system of instruction in forestry I think it would be an advantage, and there would not be much difficulty.

3136. Would they be induced to provide scholarships as well?—I have never known County Councils backward in coming forward with scholarships if they could get anyone to take them up.

3137. (*Dr. Schlich.*) You laid special stress on the financial aspect. I think you said something to this effect: that the financial aspect, in the last resort, would govern the whole question?—I do think so.

3138. Is it not of the first importance, apart from Natural Science and Natural History, that foresters should be especially instructed in those branches of forestry which tend towards more favourable financial results, such as sylviculture, the treatment of growing woods, the collection of statistics, as to which are the best methods of treatment of the diseases which attack trees, the question of rotation, and so on? Is it not of the first importance that students of forestry should be specially instructed in those branches?—Yes, I think

so. In many cases it is not the working forester who determines these things, or who influences the course of things.

3139. But those men who are really to guide the whole of this business, and who ought to be the foundation of the thing, ought to be most thoroughly instructed in those particular branches?—I think so.

3140. You agree with me in that?—I do; and I would add one more matter. If the success of a forest area is going to be gauged by the financial results, we must take very great care that the section of the scheme which deals with instruction and research is kept distinct from the general working plan of the forest area. That is to say, a certain sum must be carefully ear-marked for the purposes of instruction and experiment, and shall not be merged into the ordinary working expenses of the forest. If we do not make that distinction we shall, of course, find it absolutely impossible to show a respectable return upon the capital invested, and we shall be very liable to be met with the charge that, even under the so-called scientific system of management, forestry has not returned the interest which people expect.

3141. In other words, you propose that a separate account be kept of the actual management of the forest, and a separate account of experiments in that direction?—I think it is of the utmost importance that that should be done.

Mr. C. O. Minchin (Inland Revenue Department), called; and Examined.

Mr. C. O. Minchin.

3142. (*Mr. Minchin.*) Before you begin to examine me, sir, I would like to be allowed to say that on the first page of the statement I have supplied (*Appendix XV.*), which was prepared rather hurriedly, there is a word which might be rather misleading. That is, in the third paragraph, two lines from the bottom of the page. It says: "In order to arrive at the net income 'necessary outgoings' have to be allowed." I think probably "proceeds" would be a better word than "income" there. I am not referring there to annual income, but to the deductions which would be taken from the income; that is to say, the gross receipts arising from the felling and sale of timber.

3143. (*Chairman.*) The point I want to ask you about is rather in connection with the Finance Act of 1894, and the succession duty. With regard to Section 7, you quote a clause which limits the valuation of agricultural property on which the death duty is levied up to the extent of the superior limit of 25 times the annual value?—Yes.

3144. According to my recollection—I have not had time to look up the debates—that clause was intended to limit the death duties on woodlands to 25 times the annual value as assessed under Schedule "A" of the Income Tax Acts. But I observe that the interpretation of the Inland Revenue Department of the Act as it was passed was, that the capital value of all timber on the woodland should be included?—For a moment it was so.

3145. That is to say, that every stick on the ground was to be valued?—The idea was at first that the provision applied to agricultural property, including merely what one generally calls agriculture—tillage, and pasture, and such like—but did not touch such things as forestry. That was the floating idea in the minds of some of us at the time, but only for a short time.

3146. You valued ripe timber, in addition to the 25 years' purchase of the pastural value of the land?—Yes.

3147. That, I suppose, was found very difficult to define?—Of course, that would naturally require a most careful valuation in each case. But as regards the concrete result, I do not know that there was any case in which it really was applied, at least in any case of importance. I have not succeeded in laying my hand upon a case of importance where that rule came in.

3148. The third system, the system now in force, is that where the agricultural estate is not valued up to the superior limit of 25 years' purchase; if an estate is valued at 25 years' purchase, no value is put upon the timber?—That is so. One of the concrete examples I give will show you that. I do not know whether you have been given those examples?

3149. Yes?—One of them exactly takes up that point, namely that marked B. No. 2. There there was a considerable amount of very valuable wood—I do not know whether it was technically timber—but all that was brought in was the value of the surface; 228 acres at the annual value of only £67, which is 7s. 6d. an acre. That was considerably below the average value of the property as a whole, and that is all we get for that 228 acres, including the timber, £1,686, which is £67 odd, multiplied by 25.

3150. So in a prosperous agricultural district, where land sells at 25 years' purchase and over, there is no death duty upon the timber itself?—Practically none.

3151. On the other hand, if you do not get 25 years as the valuation for an estate, you make up any difference between the 25 and the lower valuation by the value of the timber?—Yes. The Act says that the value of any property is to be taken as the price which, in the opinion of the Commissioners, it would fetch if sold in the open market. If property were sold in the open market as a whole, the timber would be sold too. When an estate is sold, even by auction—I do not know how it is in the north—it is the universal practice in England to sell by auction subject to an agreement to take the timber at a valuation.

3152. But if agricultural land is sufficiently well situated to bring 25 years' purchase you do not value the timber?—No. There is no question then as to the timber. All we have to ascertain then is that the property-tax assessment of the woodlands is sufficient.

3153. Is there any reason why the woodland should not be taxed in the case of the land reaching as much as 25 years' purchase?—Yes, because the woodland, in the case of the land not reaching 25 years' purchase, would be itself taxed, but not the timber beyond the 25 years' purchase.

3154. My question was: Is there any reason why the timber should not be taxed in the case of the agricultural land reaching its 25 years' purchase?—Yes, the proviso that brings woodland into the description of agricultural property, because the woodland comes into the definition of agricultural property. That, the Commissioners are advised, puts the superior limit, above which they cannot go, so that they must treat an agricultural estate as a whole, with everything else that is in it.

3155. I understand. If the agricultural estate is valued at 25 years' purchase as a whole, then the only value brought in for the woodland part of the estate is 25 years' purchase of the unimproved pastural value of the land upon which the timber is grown?—That is so.

3156. But there would be nothing charged on the timber itself?—If I may say so, we are using the word "timber" now in rather a loose sense. Timber, in a technical sense in England, only means a very few species of trees, and those of upwards of 20 years' growth, and growing on their own foot. That is the legal definition of timber.

3157. Well, we will say woods and plantations?—But where we use the word "woods" generally, that affects assessments and the annual value. A plantation of old oaks growing on their own feet would be valued in a different way from plantations of oaks which were growing in stools and springing up as saplings.

3158. But that is for the valuation of timber apart from land?—For the annual valuation for rates which the Property Tax follows. Perhaps, if you will allow me to quote the words of the Rating Act it will be useful: "If land is used only for plantation or woods, the value"—this is the annual value—"shall be estimated as if the land, instead of being plantation or a wood, were let and occupied in its natural and unimproved state." I will tell you afterwards what the legal definition of "natural, unimproved" is. "If the land is used for growing saleable underwood"—and that practically means timber grown on stool, although it may be 32 or 36 years old when cut—"the value shall be estimated as if the land were let for that purpose." And if the land is used for both, it is

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left to the discretion of the Committee. Land in its natural and unimproved state may be of very small annual value for occupation purposes. In a case which came before the High Court the land, if in that state, was shown to be fit for only very rough grazing—coarse grasses, ferns, etc.—and the judges approved the assessment as amended by the justices at quarter sessions, which put the annual value at 6s. per acre.

3159. Twenty-five years' purchase at 6s. an acre?—Yes.

3160. Let us take two estates in a poor part of the country, where land could be bought at 20 years' purchase. Suppose that on the one estate there is no wood, but on the other hand there was a large timber area. In the one case, I assume, from what has been said, that you would only get, under the death duties, a valuation of 20 years' purchase for the land. On the other estate, where there was a large timber property, you would raise the value to 25 years' purchase, so long as there was sufficient timber value to enable you to get it?—Yes, that is so.

3161. So that in that case woodland would bear 20 per cent. death duty?—The timber. The wood would bear it.

3162. Five years death duty on the whole estate?—Yes, but that probably would not be unless there were a great deal of well-grown wood.

3163. I will put another case. Compare an estate in one of these poor counties, with an estate in a prosperous county. You might have an estate in a prosperous county where the 25 years' purchase was easily got with a great woodland area. The whole of the timber on the whole of that woodland area would escape death duty? On the other hand, on the estate in the poorer county, the large woodland area in the case which I have given—20 years' purchase—would have to bear a five years' purchase of the whole estate, so as to make it up to 25 years; the consequence being that in a very prosperous county estate woodlands would escape any deficiency that had to be made up, whereas the poorer the county and less the valuation the more heavily would woodlands be taxed to make up the deficit?—Yes; that is, poorer as regards value of bare surface; it is not the poorer estate.

3164. I will put it in another way. The land in the county where the land valuation stood high, under wood, would only bear death duty upon its unimproved capital value, and no duty would be levied upon the timber, whereas in a poor county you would not only rate the woodland area at its unimproved pastoral value, but you would rate the wood which is grown upon it for death duty?—Yes, that is so.

3165. I want to show how it works out under the present system?—Yes.

3166. In Ireland, I believe a very common rate at which estates are returned for death duty in Ireland is 18 years' purchase?—Yes; and that is high, except in a good county.

3167. Let us say 16 years' purchase?—In a bad county, yes.

3168. Take it at 16 years' purchase. Suppose anyone in a bad county grew a valuable timber area; there would be nine years' purchase to make up to the 25 years, would there not?—Before you arrive at the limit. But I do not think anyone would plant timber in a bad county in Ireland. It is my own country, and I know something about it.

3169. But unless there were a special Irish clause, logically you would have to?—Logically one would have to do that, unless there were a special remission made.

3170. You would, I think, find great differences in valuation if you took an estate in a crofter district in the west of Scotland, and an estate in the Lothians? You might find, I should think, some estates in the crofter district in the west, where shootings are not very valuable, which could be bought at 18 to 20 years' purchase; and in that case the balance would have to be made up by the wood, if there was any?—Yes.

3171. Therefore, the superior or maximum rate of valuation, this 25 years, is converted into a minimum rate, so long as there is sufficient timber upon the estate?—I do not follow.

3172. The 25 years' annual net value of the land is called, I think, the superior limit, is it not?—Yes. That is simply a figure which is arrived at arithmetically. There is nothing of the merits of the case in that; it is simply an arithmetical calculation. That shows you a value above which the Commissioners must not go, although the intrinsic selling value of the estate is greater, and even though it may be actually sold. Still, the Commissioners are limited to that if the property is agricultural, and if there is no hope of increased income. The hope of increased income of course might affect a timber estate; it might be possible to say this price is given by the man who is buying it because he knows that by working this as a timber estate he can get more out of it than is being got out of it at present. I do not think that has occurred, but it is conceivable that it could occur, and then the superior limit would be removed, and the Commissioners would be free to value according to the price paid.

3173. Then you go back to your first system?—Yes, to valuing according to the price.

3174. And this superior rate, beyond which you cannot go, unless there is building value, or mines, or anything of that sort on the land, is the maximum rate of valuation. But this 25 years is converted by the valuation of timber, so long as there is enough timber on the estate, into a minimum rate also. It must be 25 years so long as there is enough timber to stand the valuation?—Yes, as long as there is enough timber to bring it up to that.

3175. And, therefore, the maximum rate valuation is converted into a minimum rate; that is to say, you never get less than the full value?—Never, unless the estate, by reason of the quantity of timber, is intrinsically worth more. In that case you may get a good deal less, in spite of the timber.

3176. (*Dr. Schlich.*) I want to ask you one question in continuation of what the Chairman has put to you. The timber which is standing on the estate is utilised, so to say, you bring up the original estimate to 25 years' purchase. Suppose you have rated it at only 20 years' purchase, and then there is a quantity of timber on the ground, you can utilise that to bring it up to the upper limit of 25 years' purchase?—Yes.

3177. Is not that putting a premium on cutting away the timber and converting it into cash?—No; it is death duty, you see. And, of course, if the owner cuts the timber and keeps the money, then the money would pay the duty upon its full value at his death.

3178. If in his lifetime it is divided amongst his children, is it not likely to act as a premium on cutting timber rather than leaving it until the proprietor's death?—I do not think so.

3179. It appears to me it might act like that in many cases?—I think it does act as a premium on cutting timber after the owner's death.

3180. Yes, to pay the death duty, I know that?—Yes, but not in his lifetime.

3181. (*Mr. Stafford Howard.*) Does it often happen in practice that you have to resort to the timber to make up the 25 years' purchase?—Oh, yes, frequently.

3181.* And in a good many estates which are not valued at 25 years?—There are many estates which have a certain amount of wood, and they come on at the average price of land in a fairly good county, and that would be 23 to 24½ years' purchase. Then we look into them rather carefully, and if we find there is a good deal of woodland we question the owners as to that. They perhaps say, "Yes, there is a lot of wood, and we did not trouble to value it. Fill it up to 25 years' purchase, put down so much, and ask no further questions." That is a thing which very often occurs in both large estates and small. And that is for the reason that many estates in England are brought before us as being of the value of 24 years' purchase—rather more or rather less.

3182. And you always assume that they are worth 25 years, and the other parties have to show that they are worth less?—No, we go into the merits of the case according to the local markets. We never assume anything.

3183. But it has the effect, as the Chairman said, of making it a minimum?—Yes, in that class of case it has.

3184. (*Chairman.*) Can you say offhand what, on this side of the water, the valuations of landed estates are? What is the minimum number of years' purchase on landed estates on which they are valued for death duties?—It depends very much on circumstances, because there are many old estates that keep up the old rent-book, which may have been the last owner's; and although they never collected that rent in full, but gave some of it back to the tenant, or did not draw it all from him, or paid for extra repairs, or gave him so many loads of manure, still the old rent-book stands. And so long as it stands it is hard to get the local people to

drift away from it for assessment, and so the local assessment is kept up. For that reason there are many estates, especially old estates, where the value would come in at 19 or 20 years' purchase. I have seen several large estates returned at 19 and 20 years in bad counties.

3185. That is on imaginary rental?—That rental would be on an assessment which is out of date—probably too high—and if we could get a property tax corresponding to the annual value it would be 24. We have to put up with what the local people say. It does not always stand the test of sales in adjacent districts.

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3186. Are there many estates in the poorer counties in this country which, on the real rental, would be valued at 20 years' purchase?—In some counties there are, and in some parts of counties. There are districts in Wessex and part of Yorkshire of that kind, but I think they are going up now. A few years ago I think 20 years' purchase was about the price.

Mr. A. D. WEBSTER, called; and Examined.

Mr. A. D. Webster.

3187. (*Chairman.*) You are nominated, I believe, by the Royal Horticultural Society to give evidence?—Yes.

3188. And you propose to give us your views on re-afforestation, not only here, but in Wales and Ireland. Ireland, of course, can always be touched upon, but it is outside the scope of the present inquiry. We shall be very interested to hear your views on re-afforestation of the forests in this island?—My views are that a very great deal might be done. Our timber supplies are very limited at present, and there are several inducements to very extensive planting. One of those reasons would be the abnormally high price of timber at present, and chances of a timber famine. I think also that by the establishment of a few schools of forestry a great deal might be done by carrying on planting by the Government at the same time as the education of our foresters was being attended to. Students of forestry, perhaps, after they have served an apprenticeship of three years under a competent forester, would finish off, as it were, by going to one of the forest schools, which would be established in connection with the planting of some of these waste lands. A good deal has been said to the effect that it is difficult to establish plantations on exposed hillsides, but I have much evidence to prove that plantations have been very successfully formed, and very valuable timber has been grown at considerable elevations on exposed hillsides in Wales, and also in Ireland. I was anxious to dwell upon some of the peat bogs in Ireland, of which I have had experience. I think much might be done in connection with the re-afforestation of Scotland and Wales.

3189. In which branch of forestry have you had most experience?—Principally in connection with the management of woodlands.

3190. In this country, or in Ireland, or in Wales?—In Ireland, and in Wales, and in England. I was for a number of years in Ireland, and there assisted in the formation of plantations, which reclaimed a good deal of peat bog. For ten years I was at Penrhyn Castle in Wales, where much hillside planting was engaged in. I have also assisted at afforesting in Scotland.

3191. Did you sell much timber?—A great quantity.

3191.* Did you find it pay well?—Well, on Lord Penrhyn's estate, particularly where plantations were formed with a view to their paying, it did. In many cases plantations are formed as coverts for game shelter. I think you cannot very well have game and timber, and work the two together satisfactorily. The plantations for game covert require to be thin; the trees are placed so as to induce the undergrowth for covert, and it is difficult to have trees and timber clean of growth when grown sparsely on the ground. So as to produce the finest timber you require to grow the trees thickly on the ground, much thicker than you would if game covert were the first consideration.

3192. You attach considerable importance to forestry?—Very great; I think it is very much neglected.

3193. How were you trained yourself?—I was for a number of years with my father, afterwards for two or three years on what I might call an apprenticeship. Then I was foreman on another property; and afterwards I finished off at a school in connection with forestry. I have done a great deal towards my own education in the line of forestry.

3194. Which school was that at?—It was a school rather in a private capacity; not a public establishment in connection with forestry. I have a scheme drawn out for the education of foresters.

3195. Do you think that there are many foresters who would be glad to have opportunities for instruction in forestry?—I think there are very many; but you cannot expect a forester, with perhaps an average salary of £100 a year, to be able to educate himself better than he does at present.

3196. I suppose he should be educated before he gets to the £100 a year line?—Yes, but how? How can you expect it for that salary? For £100 a year it is hardly worth while educating yourself. But I think if the idea I am bringing forward were adopted it could be done.

3197. What is your view?—It is this. If a forester spent three years as assistant on any property, and were then to go into a State forest, where classes could be attended, it would benefit him very greatly. Or if the Government were taking up the planting of these waste grounds, they could employ foresters who had already served their apprenticeship in another place, and who could assist in carrying out the work in the Government plantations, which would not only be a saving in their formation, but the forester would at the same time be finishing off his education. The scheme would be too long to give you here, but I think it would be a very workable one.

3198. You are thinking of it in connection with the State forests?—In connection with State forests, if the Government took up the planting of waste ground.

3199. Do you think you would train them in connection with the State forests?—The forester, after serving three years as an apprentice, would go to the State forest under a capable forester. The young or assistant forester throughout the day would possibly attend to his various duties in connection with the laying out and management of these areas for planting, and it might be that later on he would give attention to the converting of the timber. In the evenings, or at other times, he could attend lessons, which at present he has not an opportunity of doing. I think if six schools were established in various parts of England, Ireland, and Scotland, and were placed where the greatest amount of Government planting was going on, and that the pupils were afterwards to go on to the management of the forests, that would be the best way of educating our young foresters.

3200. Do you find that most land-owners and agents know much about the management of woodlands?—No; and I think it is a very serious drawback that so many of our great woodlands are entrusted to the management of estate agents, gardeners, and carpenters. I have in my mind several instances of woodlands which I have visited recently, in which great quantities of timber have been planted on the wrong class of soil. There are some very notable examples. I think a very great deal might be done if only competent foresters were engaged in the laying out and management of the woodlands.

3201. Under the present system of training there is a dearth of competent foresters?—There is, but there would not be if proper wages were given. But, of course, you can hardly expect a man receiving £100 a year to care very much about the profession. Many foresters have given it up, and have gone into other lines of life.

3202. Do you think it would be good if landowners and agents were trained also in forestry?—I do not think it is necessary.

3203. With regard to the disposal of home-grown timber, you have had experience of that?—Yes, I have had a large experience of that.

3204. Do you think that the quality is deteriorating, or that it is improving? I mean the home-grown timber?—I do not think it is deteriorating; I think it is rather improving; but I think a good deal more might be done in connection with the matter if a good deal of re-afforestation were going on. I think too that our present system of disposing of it is not good.

3205. How do you think we should dispose of it?—I think a great deal of the home timber might be used on the estate. There are notable examples where they have established sawmills to cut up timber for estate

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purposes. As a rule in the sale of the timber the timber merchant has the best of the bargain. I do not mean that all the timber which is used, say, in house building should be or could be grown on the estate, but I think very much more might be disposed of in that way than is at present the case.

3206. Do you think most foresters are competent to deal with the manufacture, and valuation, and transport of timber?—Not at present.

3207. They want to be trained in that also?—They want to be trained more on the scientific side, I think. On the practical side they are able to manage, but they cannot afford to finish their education as they should. I think by establishing these State forest schools, schools at the expense of the State, there would be a training which would give a very much better education than at present.

3208. Have you managed woods which were devoted exclusively to timber without regard to game, or ornament, or show timber?—I have managed those which were in combination; where the timber was for disposal, and also for game covers. On the Penrhyn estate the timber, in certain districts, is grown, and the plantations are managed in view of game as well as for the timber. It is a difficult matter to work between the two.

3209. (*Mr. Stafford Howard.*) You were in Wales 10 years?—Yes.

3210. Did you plant much?—Yes, a good deal, on the Welsh hillsides.

3211. In what parish?—In Llandigai and Llanllechid.

3212. You mean just above Bangor?—Yes, at 800 to 1,000 feet altitude above the sea. I formed the largest plantation of larch principally, although there was a good mixture of Corsican and Scots pine along the margins.

3213. Those plantations have done well?—They have done remarkably well. Previously to the planting of those hillsides nothing could exist on the slopes but the hardiest mountain sheep; it was quite a wind-tortured place. But now, with the establishment of plantations, cultivation has gradually crept upwards, until now at the base of the plantation the farmer is able to cultivate farm crops; and he can keep mixed stock, whereas previously the hardy Welsh mountain sheep alone could survive. It has done much good in that way.

3214. But that was where Lord Penrhyn had the whole of the property in his own hands?—Yes.

3215. There were no rights of common; he was not merely Lord of the Manor, but he owned the farms as well?—Yes.

3216. Therefore he could do as he liked with it?—Yes, the rental of the ground, previous to the planting, was about 5s. per acre.

3217. In connection with the sheep farms?—Yes, I think that is one of the most notable examples of the good that a plantation has done, in affording shelter on a farm that I know of.

3218. How many plantations?—There were several, varying from 100 acres to 30 acres.

3219. Would there be 300 acres planted altogether?—On the Penrhyn property, yes; not planted by myself. But there would be a much greater area than that on the hillside.

3220. On what you call the wild hillside, how many acres of plantation would there be there besides those you made?—2,000 acres perhaps, I should think; perhaps less, say 1,500 acres.

3221. What is the altitude of that?—From almost the sea-level to 1,000 feet.

3222. What I want to get at is, how many acres are there planted at the high altitudes?—At 800 to 1,000 feet?

3223. Yes?—About half the acreage, but not in one plantation.

3224. Scattered about?—Yes.

3225. When you speak about the State making these forests on the hillsides, do you propose that it should make scattered plantations of 50 to 100 acres here and there?—No; I think they could make a plantation of not less than 300 acres each time.

3226. Where do you suggest they should be made?—I suggest the range of Snowdon as a notable example, and in Merionethshire. I think there are very many vast tracts of country which would do very well for the cultivation of timber.

3227. Do you know anything as to the nature of the land-holding in that district?—Yes, I know it very well.

3228. Are you not aware that over the greater part of these hillsides there are common rights, which cannot be interfered with, except in the particular cases where, as in the one you mentioned, the holder of the land is also the owner, which does not always happen?—In most of Carnarvonshire, where there is very much waste land, you can plant if you like, but the Government can step in and cut down your timber on account of the minerals in the ground; but if the Government took over the districts, and the planting of them, that would not be likely to occur.

3229. But the Government would then have to buy up the whole mountain, and the sheep rights as well?—I suppose they would.

3230. You think it would pay them to buy up these high altitudes?—I think it would.

3231. From your experience on Lord Penrhyn's estate, that is?—Yes.

3232. And if it were done, it would be on a large scale?—I do not advise it for less than 250 or 300 acres. In the case of Lord Penrhyn's estate the plantations were to a great extent laid out for the sake of the ornamental appearance of the hillsides as well. That, of course, does not require to be taken into consideration so much as the laying out for the sake of the timber solely.

3233. If you are to have these highly-paid foresters and others to work under them, who shall carry forward a forest school as well as do the forestry work, it must be done on a large scale?—It would be necessary if you established a school of forestry in connection with large plantings. In Wales, that is to say in Carnarvon, Merioneth, or Denbighshire, where there are very large areas of waste land, these could be planted and worked as plantations, and the young foresters could assist in the management; I do not mean in the manual labour, but that they could oversee such things as fencing, etc. But no forester would be able, on the wages he gets, to pay for his education. That is the unfortunate part of the training in Edinburgh. In those schools you have to pay very highly to get the scientific side of the education, which would be done away with if what I suggest were carried out; that is, if the Government were to found schools in connection with the laying out of these plantations, and allow young foresters who had served three years to assist in the laying out of the plantations—that is to say, the superintending of them. They should be paid for their services, so that their education would cost but little, and the plantations would thus be formed better and at less cost to the Government.

3234. Have you any figures to produce in connection with these plantations at high altitudes?—No, I have not. I have such figures, but not here. In some instances the plantations have been too recently formed to allow of any profit for 20 or 25 years.

3235. But we could have the cost of forming them?—Yes, I could give that information, if necessary.

3236. If we could have those figures we should be glad, that is the cost of forming plantations at high altitudes; and we should like any figures of old plantations you have, as to the cost of maintaining them, and what they produced?—Yes.

3237. In that portion of Wales which you have referred to, and which you are acquainted with, you have not been over all the wastes?—Yes, I have been there, and I have been a good deal over the country in a professional way, so I am acquainted with many of the forests throughout England and Wales.

3238. I mean these big wastes in Wales. Is it in your mind that they might be planted? Would it be well to look at them for that purpose?—I have reported on them for planting already in connection with estate purposes.

3239. What places have you in your mind where State forests should be established? Where is there room to plant on such a scale?—I think that in almost any county you could get that.

3240. I am referring to Wales?—In Carnarvonshire, from Aber all along the mountain side to Ogwen Lake. On the hillsides there you could very well grow a good crop of larch.

3241. Do you think sheep farmers would like to be taken from their holdings?—I do not think they would object to it, but they would be very much obliged for the shelter which is afforded by it. In a letter written to me by a farmer on Lord Penrhyn's estate, where a plantation was formed, he said it was a God-send to him and his stock, because on those hillsides the wind is almost unceasing.

3242. I quite agree with you with regard to a plantation for a shelter, but where you do it on a large scale you will have to occupy land which is now occupied by sheep graziers, and you must therefore get rid of some of those graziers?—But if you provided shelter they could have a better class of stock, because the small mountain sheep which alone survives here is not very profitable or remunerative, but it is the only one which will live on these exposed hillsides. But if a plantation were formed where the land could be grazed by cattle, which are more profitable than sheep to the farmer, he would do away with the sheep and take to more profitable stock. I have very little doubt of that.

3243. Your experience is that it has been successful in that part of the country, at all events?—Yes; apart from the value of timber produced, it has been a success as affording shelter.

3244. What is the aspect of these plantations?—All aspects.

3245. What is the aspect of the Penrhyn estate?—Varying, south-westerly; but at the Pass of Nant Francon it would be north, and larch has done very well; and on that pass the altitude is fully 1,000 feet.

3246. (*Professor Campbell.*) You have told us of your success on these wind-swept hillsides. What was the character of the soil there?—Well, in most parts, particularly on the Penrhyn side, it would be mostly loam, fairly good sandy loam. Of course, rock would be found cropping up every here and there.

3247. Suitable for tillage?—Not exactly suitable for tillage. We plant at possibly higher altitudes than tillage could be engaged in.

3248. But the area under tillage crept up to the trees planted?—Yes, very often.

3249. So the character of the soil on this hillside was somewhat exceptional, was it not? What you say would not apply to many hillsides in England, Scotland, or Wales?—I do not know, but I think it would. I have been over many of the hillsides in England and Ireland, and the soil seems very similar to that in Wales. Wales, too, is like many parts of Scotland in the matter of the hillsides, and all would produce excellent crops of timber. Where my father formed several plantations, at Balmoral, for instance, the soil was granite, but you can see the success he had under such unfavourable conditions.

3250-51. Is there much land in England and Scotland that could not be planted, that would be too poor to plant?—Of course there is, but it is at much too great an altitude to plant. I do not think you could plant at a greater altitude than 1,300 feet.

3252. But below 1,300 feet the great bulk could be planted?—Yes, I think so; or you might say under 1,000 feet.

3253. It is not too poor, you think?—No, not if you properly choose your trees for it.

3254. (*Colonel Bailey.*) You speak of establishing a forest school in Wales, I understand, in connection with one of the areas which you would plant?—Yes.

3255. What kind of area are you thinking about in connection with a forest school?—Well, it would depend upon circumstances.

3256. What would you yourself wish to have? You said you would have 250 or 300 acres; but that would hardly be enough to establish a forest school?—If you could have several plantations of that size in close proximity, the forest school could be situated somewhere near.

3257. In reference to Mr. Stafford Howard's suggestion about the acreage which it would be possible to find in the country, if you could get several areas of the size you mention sufficiently near each other, you would be able to establish a forest school in connection with them?—I have no doubt of it.

3258. (*Mr. Marshall.*) These plantations which you told us about near Bangor, on Lord Penrhyn's estate, are they larch or Scotch fir?—They are larch, Corsican and Scots pine. Owing to the fact that it is such a wind-swept district we had to plant the particular kinds of trees which would stand. We had mountain elm or elder, and Austrian pine along the margin; we also planted many other trees, such as the Douglas fir, and these are growing there at a considerable altitude.

3259. I understand about the trees which you planted round the outside for your shelter belt, but what I want to know is, did you plant the conifers mixed inside?—Yes, mixed.

3260. Had you any larch there?—Yes.

3261. And what was your experience? That is, did you find mixed plantations were less liable to disease than pure plantations?—I would not say so. If I planted them solely for the value of the timber I would not mix them.

3262. You would not mix the varieties of larch?—No.

3263. You said, I think, that a good many foresters had been trained to forestry, but had gone into some other calling because the pay was not high enough?—Yes, I have numerous examples.

3264. But those men who went through the training, did they not know what they would be likely to get as foresters, and what wages would be offered them?—They might, but one generally expects to succeed well when setting out. There are a few good places in this country, and if you can get one of these you are very well off; if you do not get into one of these you must keep a lower rate of pay.

3265. And I understand that all these men were competent, as far as you know, to take such places; that they first of all got the places, and then they found they were not getting as much money as they expected, nor such rapid rises as they expected; and therefore they went to something else?—Yes, that is often the case; there is an example in myself. I left the best place in England to take up my present position, because I was not getting sufficient remuneration.

3266. A good deal of the evidence before this Committee has gone to prove that there were very few men of that sort about the country available; that is, really trained men whom you could take into the woods to advise you about the laws of woods and the suitability of the soil; and the evidence which has been before us is that there are not very many of these men about?—Because the pay does not allow them to be about, and they have no facilities for finishing off their education. The previous part of their education, the first three or four years, is very good, but there are many things which a forester, unless he has special facilities, cannot teach. He has not the time or ability. Therefore if the State were to take over these forests and put competent persons in charge, foresters would have opportunities of learning from them, and attending evening schools in connection with carrying out State forests.

3267. I gather that these men were not those who were trained in every branch of their profession; that they had not got as much knowledge as they should have had?—I think the majority of British foresters have not.

3268. So there is a great deal of need for more education?—Yes, that is one of the great points and one of the things I recommend.

3269. Now I would like to put to you one or two questions about the timber in Wales. We have had some evidence on that point. Is the timber on Lord Penrhyn's estate used for pit wood?—Yes, a great deal of it was sold in different ways; that is, so much per lineal yard or per cubic foot. In London it seems to be generally sold at so much per cubic foot.

3270. The small timber would go into stacks for the woods, what they call pit wood? It is not measured by the cubic foot; it is stacked up. There are so many cubic feet in the whole lot?—The poles of various sizes, sawn to three inches diameter at small end, were totted together and sold at so much per lineal yard.

3271. All the timber suitable for pits was sold at so much per lineal yard?—Yes.

3272. What was the price of larch there, for the best

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timber?—The prices of timber are not good in Wales; nothing like what they are here.

3273. About what was the price?—1s.

3274. (*Dr. Somerville.*) You have had considerable experience of forestry in the South-West of England?—Yes.

3275. You are acquainted with the copse woods in England?—With many of them.

3276. We may take it, I suppose, that copse woods are unprofitable nowadays?—Well, the prices are not as high as they were twenty years ago.

3277. Do you suggest that these copses should be converted into high forest, or be left till the times get better for that class of wood?—I do not think it will ever improve for that class.

3278. Do you recommend that steps be taken to convert them into high forest?—I do, and I have done a great deal towards that in the county of Kent.

3279. Do you plant your seedling trees after you have cleared off the copses? Is that the way you proceed to make the conversion?—A better way is by planting previous to clearing the wood, so as to give shelter to the woods which you plant. Another way is to thin out some of the trees, and leave the best oaks on the stump, and plant up through the woodland with your standard crop, then cut away the stools as your other timber is coming on.

3280. Do you find that land which has proved suitable for copses is also suitable for larch, and Scotch fir, and spruce wood?—Not for spruce, but for larch I should say; it would be too dry for spruce.

3281. (*Chairman.*) Will you put in your scheme of education, Mr. Webster?—I have not it here with me.

3282. Could you let us have it?—Yes.

3283. If you will do that we will look into it. Is there anything else which you want to put in?—There is nothing if you are not going to deal with the bog lands of Ireland.

3284. (*Dr. Schlich.*) When you give us that account of expenses in connection with planting in Wales at those high elevations, would you be good enough to put the expenses under the different heads? Taking a certain plantation, would you give the area, whatever it may be, and then say so much for the preparation of the soil, so much for the cost of plants, so much for putting them in, so much for fencing, and so on? That would be very instructive for us?—Yes, I can give that. But in the case of Lord Penrhyn's plantations they were not made for profit, and we formed them in the same way as if the Government were to do it.

3285. If you say how much you spent per acre, that would give us an idea of the cost?—Yes.

3286. (*Professor Campbell.*) Perhaps you will also put in a paper on the bogs of Ireland, and your experiences in Ireland?—Yes.

3287. (*Dr. Schlich.*) Have you any experience of planting on bog land?—A large experience.

3288. In what part of Ireland?—On the shores of Lough Neagh, and a full account is given in the Highland and Agricultural Society's Transactions.

3289. Where is that?—In the county of Armagh, on the banks of the Blackwater.

3290. Were they large estates?—They were not large plantations; but as they were formed 32 years ago, I examined them lately, and reported upon them, and I was surprised at the great improvement of the land. Formerly this bog was only of value for snipe shooting, and for cutting turf for fuel, and there were quagmires as large as this room. I was surprised to find how dry the soil was, and how well the trees had succeeded.

3291. Have you examined the depth of that bog land?—16 feet I have seen it dug to. But it varies much.

3292. Did you plant on that? If so, what?—Yes; there was a general mixture, larch, Corsican pine, Austrian pine, Douglas fir, and so on. I am sorry I have not my notes with me, for I could have told you exactly.

3293. It was originally pure peat bog?—Yes, bog from which they cut turf for fuel.

3294. Was it drained?—Yes.

3295. At what depth?—The main drains were, as far as I could say, about 6 feet in depth. The minor drains were less.

3296. What does the bog cost to drain?—I can give you the whole cost of it. It is all in the Transactions of the Society I have mentioned.

3297. You have examined it, and found 16 feet of bog?—Yes, 16 feet depth. I have seen through many of the bog lands 16 feet depth of bog cut.

3298. Was it drained immediately before planting, or did it lie for a number of years after draining?—It was drained for two years, and it was soiled. The soiling consisted of a number of Irish mud cabins which had been pulled down, and the whole cost of formation was very little. Each pit got a spadeful or two of this as a start, but it is surprising to see how dry it is now. Some of the butts of the trees were being sold for 9s. each, and that is very good.

3299. What height do they reach in 32 years?—The average height would be 37 or 38 feet.

3300. Did the Corsicans do well there?—They did very well, but the Douglas pine and the larch did the best. The larch is fairly free from disease.

3301. Was the Weymouth planted there?—Yes, but they did not do so well.

3302. I was in County Galway some years ago for the Congested Districts Board, and they wanted to know what they could do with bog land. As there was nothing to go by—I did not know of this splendid example which you have mentioned—I decided to go to the North of Germany, where they had been making plantations on bog. There I found plantations on bog land, and that I could pick out all the places where the bog was more than 3 feet deep. Up to a metre, or say a yard, the success of the plantation was very good, but the moment we came to a place where the bog was a foot or two deeper than that there was a decided falling off. You could go over that plantation, several thousands of acres in extent, and pick out the places where the bog was more than a yard deep. Where the plantation was bad you had only to dig, and you would find the bog 4 feet or more deep. So I am surprised that you had that result with 16 feet of bog?—But you will find a great variation in the depth of the bog. The bogs of Ireland are not like those of Germany, evidently.

3303. I speak from memory, but I think the bog in Germany was from 1 to 10 feet thick. If you say bog in Ireland is of an uniform depth, that means the bottom must be at the same level, or form a uniform slope. I do not see how the result you mentioned could come about unless you put some soil there first?—But bog land cannot be formed unless there is a certain depth of water. You must have a quagmire.

3304. Perhaps we do not quite agree about what peat bog means. I have no further question to ask.

3305. (*Professor Campbell.*) Have you had experience of any other part of Ireland except at Lough Neagh?—No, except to see them.

3306. Was the soil in all cases very similar?—Yes, very much the same. If you or anyone saw these plantations on the shores of Lough Neagh you would agree with me, knowing the date at which they were planted, that they have been a very great success, and I think that to the poor Irish people the labour of forming extensive plantations would be a very great boon. I think the laying out and establishing of plantations would be one of the means of doing a great deal of good in Ireland. Repeatedly I have been asked by Irish landowners to sell timber to English merchants, but as a rule they do not care to do so, because it is not worth their while to purchase the small quantity that is offered. In some instances the merchant said that if I would give him a guarantee of a specified quantity for several years in succession he would go to the trouble to find out freights; but with the present small quantity it is hardly worth while. So if there were a greater quantity of planting in Ireland, I think it would open up an industry which would be a vast boon to the country. Twenty-five years after they were established these plantations would give employment to a large number of the inhabitants. The conversion of timber, the taking of it down to the ports, and its export to England would be great.

3307. Have you lived in Ireland for many years?—Seventeen years.

3308. There is a great demand for land there?—I do not know where. There is more waste than cultivated land.

3309. But there is a great demand for land in Ireland, is there not?—I never knew it.

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3310. You do not know it?—No. My experience is that there is a greater waste of land in the corners of fields in Ireland than there is in England and Scotland.

3311. Do not the Irish people want to increase their holdings?—They may, of course, but the places I suggest planting would be of small value as holdings.

3312. Bog land is chiefly what you have spoken of?—Yes, principally.

SIXTH DAY.

Wednesday, 7th May, 1902.

PRESENT:

Mr. MUNRO-FERGUSON, M.P. (*Chairman*).

Sir JOHN F. L. ROLLESTON, M.P.
Mr. EDWARD STAFFORD HOWARD, C.B.
Professor W. SCHLICH, C.I.E., F.R.S.
Colonel FREDERICK BAILEY.
Professor JOHN R. CAMPBELL, B.SC.
Mr. JOHN HERBERT LEWIS, M.P.
Mr. GEORGE MARSHALL.
Dr. WILLIAM SOMERVILLE.

Mr. REGINALD H. HOOKER, *Secretary*.

Mr. JOHN MICHIE, called; and Examined.

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3313. (*Chairman.*) You represent the Highland and Agricultural Society of Scotland?—Yes.

3314. Are there any particular points on which you wish to be examined?—Well, I thought of simply two heads, namely, the importance of the teaching of forestry in the country, and the acquisition of an experimental area for the teaching of the practical part of the subject.

3315. What are your views on forestry education; do you think there is need for it?—There is very great need for it. That has been my view for a very long time indeed. Seeing that we lag so far behind other countries, and in view of the fact that I have no doubt at all that a universal timber famine is imminent, there is a great need for it. Some people put it at greater dates ahead than others, but from having paid attention to the general trend of things I do not think it can be delayed beyond some 30 years. Therefore I think it is beyond doubt a pressing question that the question of education in forestry should be tackled as soon as possible, that it should be tackled from the scientific point of view as well as the practical, but especially the practical, in this country, and that the two should go hand in hand. That is, were an experimental area obtained, I think the seminary for scientific teaching should be situated upon it. Of course I am speaking of Scotland, in which my experience has been obtained. The seminary should be in a central part of Scotland, where a variety of soils could be obtained of different exposures and different altitudes for the growth of the various species which are capable of being grown from a sylvicultural point of view in this country.

3316. Your experience is confined to Scotland practically?—Practically, although I have visited other places. I have been to Germany.

3317. I believe you are the Forester at Balmoral?—I was Forester at Balmoral. I am now the King's Factor or Commissioner there.

3318. With control of the forests?—Yes.

3319. What area are the woods over which you have control?—About 6,000 acres.

3320. Have you experience of any other parts of the country?—Yes, in Perthshire, Banffshire, Inverness-shire, and other parts of the country. My experience pretty well embraces most of it except the extreme north.

3321. Have you yourself felt the need for a thorough technical and practical training in forestry?—I have all along, but more particularly in the days when I used to be going from place to place, because you never get the same information twice. Where an experienced forester in those days, some 30 to 35 years ago, would have told you to thin a great deal, the next one would have told you that you were overdoing it, and they all had their various ways of planting, so that it was a kind of enigma that a youth was landed in in getting his knowledge of forestry in this country.

3322. Do you find an absence of record?—Yes.

3323. Of continuous management?—Yes.

3324. And that still exists?—Yes.

3325. Do you think there is a general desire amongst the working and head foresters for a regular forestry training such as that with which you became acquainted in Germany?—Unquestionably. Some of them have modified ideas about it. Some of them think (and possibly there is a good deal in it) that the German method as established there might not be in every detail adapted to this country, but my opinion is that you cannot go half way in the matter. You must adopt a system which is known, and the modifications will come later by experience.

3326. And of the classes which are connected with forest management in Scotland, which do you think it is most necessary to educate, the owner, the factor, or the forester?—By all means the three; but very specially the forester, the man who has the practical management.

3327. Do you think that in Scotland the head forester has sufficient weight to make his influence felt in the estate management so as to guarantee proper timber culture?—I am afraid not under existing conditions; but I think it ought to be so. If you educate the proprietor and his factor to a certain extent, you will get them to agree with the forester in his movements probably. Therefore I think it is very advisable that the three should have a knowledge of forestry—all concerned.

3328. Your view is that there should be an experimental area with a school upon it?—Yes, that is my opinion.

3329. Have you any ideas of any other form of forestry education, such as in connection with the University classes or in the schools?—There are so many sciences bearing upon forestry; in fact, from what we have been hearing in recent days, one would expect to find a British forester a sort of walking encyclopædia of knowledge. That is to say, he must know about chemistry, he must know about agriculture, all sorts of trainings, geology, and a great many of the sciences. In connection with the advancement we are making, which I hope will go on, County Council Committees and Evening Continuation Schools, all ordinary elementary schools throughout the country, produce an education which

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would be sufficient, in my opinion. If it goes on advancing as it has done, the young man or the boy in his earlier teens will receive a smattering of information at these classes which would be a great advantage to him afterwards, and would put him in a position, before entering upon his curriculum of scientific and practical training, at a site where you had a large experimental area (and it should not be less than 10,000 acres, with the seminary for actual scientific forestry education upon it), of obtaining a great deal of useful knowledge. I am putting the matter perhaps lower than some other people will. They say that this young lad should go to the forest centres of scientific training; but that cannot be expected from the fact that in this country, on the ordinary run of estates, he never can expect to get more than £100 a year, and very frequently much less, according to the existing state of things. Even in future days it is difficult to see how a forester pure and simple can be very highly paid—to be so highly paid as to warrant his going through a lengthened and minute and varied curriculum.

3330. Then you would attach importance to the forestry training of factors?—Yes, I would. But here you are met again with the difficulty that you cannot make him a practical man.

3331. Would the training of owners and factors have an indirect effect by raising the remuneration of foresters?—I should think there was little doubt about that. It is, however, on its merits I speak of that—namely, that ordinary-sized estates I do not think will admit of large salaries being paid.

3332. Then you would call in, perhaps, one expert to control a certain number of woodlands belonging to different estates?—Yes, that would be a very good idea indeed.

3333. In the same way that Mr. Grant Thomson manages various woods?—Yes; in the same way that I have been called upon to do it myself in various parts of the country.

3334. You think that an area of 10,000 acres should be set apart, partly, I suppose, under timber, and partly to be planted as a State Model Forest School?—Yes. It is a matter, however, that would require to be gone carefully into in my view. It would require when purchased to have a certain amount of old timber of as varied a kind as possible.

3335. Do you think it would be possible to buy that land if it was done judiciously, at a rate which would not involve any very heavy loss?—I do not see why it should in the end; but gains would necessarily have to be deferred. It ought, in time, to be a paying speculation. You know as well as I do that it takes a hundred years to rear a forest.

3336. Meanwhile, if it was in a moorland district you would get a grouse rent for a considerable portion of it?—No doubt you would get a grouse rent in Scotland. So long as it was moor and grouse.

3337. And so long as a portion of it was bare you would derive other revenue than merely the timber revenue?—That is so. You would get other revenues. If it was under agriculture you would get your agricultural revenue.

3338. Either from game, or from agriculture, or from grazing you would get some return in addition to the return from the woods?—Yes.

3339. Taking it altogether, do you think it would be possible to buy such an area and to obtain some interest on the money expended?—Oh, yes; I have no doubt about that. It might take some time to get a place suitable in all respects; it depends upon the disposition of the proprietor of a suitable place to sell.

3340. What do you think a good centre?—I do not think Perthshire could be beaten, where you have low ground, medium hill ground, and even high glen ground. I think the three varieties ought to be there.

3341. And on that area would you find employment for working foresters, and would you give instruction for all classes of those connected with land, or only for the working foresters?—I should give instruction there and nowhere else to all three, so that they might be brought together in the science and practice. The science of forestry is so mixed up with the practice of it in this country, and everywhere else, so far as my knowledge goes, that it is impossible to separate them in the teaching.

3342. Your scheme would involve a heavy expenditure?—But a desperate disease needs a desperate cure.

3343. You do not think that the scientific instruction can be so profitably given at the University of Edinburgh as in the forest school in Perthshire?—I would not like to employ a man who had his training in the University of Edinburgh to go and overlook the practical work of an estate.

3344. You would not trust the owners and factors who had had their training there?—No.

3345. You would prefer it in the forest school?—I should.

3346. (*Professor Campbell.*) In talking of the proposed central experimental area, you said that it would be necessary to have all soils, altitudes, and aspects. Do you think these can be obtained at one centre?—Perhaps that was rather strong, but I do think that the forest school and the experimental ground ought to be at one place. Excursions might be made to others at certain seasons of the year. You cannot get everything in one spot on the surface of the globe, but you can get a place more suited to it than the majority of other places; that is to say, you can get a place with a variety of soils, with a variety of altitudes, and a variety of exposures.

3347. So that if you could not get it all in one, you would be in favour of having different centres, but I take it that your main working forest would be principally where the teaching would be given?—Yes, the principal one, and the only one so far as the actual teaching and experimenting is concerned, but other parts of the country might be visited.

3348. I understand that you have yourself studied some of the sciences to a small extent?—Yes.

3349. Which of them do you think would be of most service to you in your work? I think you mentioned chemistry?—I am afraid I have not studied much chemistry in my time. Geology is certainly an important subject.

3350. Are you prepared to offer an opinion as to the absolute necessity of foresters having studied these subjects? — Not to any great extent, but roughly. If he knows the effect of limestone, if he knows what he is to expect upon granite, and what he is to expect from the Silurian formation and the soils resulting from them, it would be sufficient.

3351. So that the science training a boy gets in a good grammar or secondary school would be quite sufficient?—Yes, in the secondary school I think it would.

3352. You would then put him direct into the forest?—Yes.

3353. Would there be any need for any further scientific education?—No, there would be no need for university education and no remuneration for it when you got it.

3354. You mentioned that a timber famine was imminent. Have you looked into that question yourself, or are you merely giving an opinion formed on what you have read?—I am giving an opinion of what I have read, and from coming in contact with those who have travelled more or less in the various countries from which our timber supplies come.

3355. (*Dr. Schlich.*) I wish to ask you some questions about the timber famine to which Professor Campbell has referred. You have arrived at the conclusion that a timber famine may be expected in about thirty years?—Yes.

3356. I should be much obliged if you would tell us on what grounds you fix upon that number of years?—I may give you one as an example. Thirty years ago and even less, everybody who pretended to know anything about timber, such as wood merchants and people who came from the actual ground, would have told you that the American forests were inexhaustible. Even then I was not of that opinion, because everything has an end, and, as a matter of fact, nowadays the Americans require most of their timber themselves. They are importing to a considerable extent from Canada, and we have the greatest difficulty in this country in getting yellow pine, which used to be sold at about 1s. a foot; 5s. a foot is being paid for it nowadays. That is one example that I went upon in fixing that number of years. All are agreed that the timber supply of the Scandinavian peninsula is fast being exploited, and authorities in that quarter agree that we shall have little chance of getting much from there by that time, of the old quality of stuff at least, and the young will barely be ready.

3357. I asked you that particular question because a French authority has said that the timber famine would be upon us in 50 years. I had an opportunity of writing on the same subject, and I said that according to my idea it would come before 50 years, so that you agree with me that it is likely to come before the end of 50 years?—I do unquestionably.

3358. Speaking of the education of the proprietor, the factor, and the forester, you said, especially with regard to the education of the factor, that you could not make him a practical man, that you did not wish to make him a practical man, but do not you think it is of the utmost importance (considering that at present the forester very often does not carry the necessary weight, as you have pointed out to us) that the factor or agent should be educated sufficiently with regard to forestry questions, so as to understand and appreciate what may be placed before him by the forester?—Unquestionably.

3359. And do you not think that the same applies, and perhaps even with greater force, to the proprietor? Of course you do not want to make the proprietor or the agent go and swing the axe or plant the tree, but do you not consider it of the utmost importance that both the proprietor and the factor should have sufficient knowledge of the forestry business to appreciate its importance, and should understand what is put before them by a practical forester?—I do, and hence my opinion that he should be educated on the actual ground upon which the forester is educated.

3360. So that you agree with me on the main point, but you want the proprietor, agent, and the forester all educated at the same place?—Yes.

3361. Do not you think there would be difficulties in the way of that? Do you think you would get many proprietors to go to that particular place? The proprietor of a landed estate, just as likely as not, will go to a University, and do you not think that he would be much more likely to acquire a certain knowledge, if he has an opportunity of doing so, while he is at a University, rather than if he went and spent I don't know how many months, whatever the time may be, at a special establishment where the forester is educated?—I am afraid if it is necessary for him to have the information that he will require to be at the other place in order to see men doing the thing. Forestry is so much a matter of practice that unless you see something of the actual practice the education is not of much advantage. The science of the question, so far as I am aware, judging from my experience of those who have turned up saying that they knew something of the science of forestry, does not count for much without the practical knowledge. When you come to take such men over the actual ground and show them what it is, you find they know nothing in the world about it. There are exceptions, no doubt, but always giving a certain amount of law for common sense, it is such a rare sense, somehow or other, that when you get the scientific man, you find that he knows very little about the subject. The forester may perhaps come afterwards and say that a certain thing was properly done, and the scientific man would say that it was not, and that he did not need the forester's services. All the while, however, it is quite possible to imagine that the forester is doing his work well. I think that the landed proprietor should go to this seminary and take his walk in the forenoon or in the afternoon, as the case may be, and see the work being done, and take the scientific part of his education in the matter at another part of the day. There may be difficulties in the way; no doubt there are, but it seems fruitless for the prospective landowner to spend his time at the University in being educated in some things; but if he, as he ought to do, attaches sufficient importance to his paternal estate, he ought to go for a year, or at least for certain portions of the year, where he would obtain the best possible information on the science and the practice of that important department in connection with his property.

3362. You say "science and practice"; but who is going to teach him the science at a particular school where you would educate the foresters?—He must be taught by a teacher who knows, simply just as he is taught other things.

3363. Do you not think you would have to keep quite a number of teachers at that place if you were going to carry through that scheme for all three?—There would need to be teachers for the various branches, no doubt.

3364. You must be aware that the results of investigation and of practical experience have been brought together in such a way that a proprietor or a man who tries to train himself as a factor could in a short time, while, say, at a University, or whatever the educational establishment may be, get a general view of what is known about the treatment and management of forests, and if he afterwards, on the top of that, goes actually into forests here and there and compares what has been put before him in the lecture-room with the actual state of affairs on the ground, do not you think he would be much more likely to get a more general view of the business than if he goes to one particular point and studies in the same place, where all the details and the minute working of the forest are gone through?—That would be possible, but I still adhere to my opinion with regard to the matter. The other would be the near way to it.

3365. (*Colonel Bailey.*) You said just now that you found men who have been through courses in this country have not a good practical knowledge?—Yes.

3366. You are aware, of course, that there are no facilities for giving them practical knowledge—that we have no forests in Scotland at the present time that have been managed correctly for a sufficiently long time to make them available as fitting fields of practical instruction—that is so, is it not?—Yes, I suppose so. I am aware of only two places in Scotland where the science of forestry is professed, yours and that of Professor Balfour's; both are well conducted, but there are no facilities for practice.

3367. Take my own course at the University. You know, I suppose, that I have no field of practical instruction available?—That is so.

3368. But do not you think that if a field of practical instruction could be provided that might put a very different complexion on the matter?—No doubt it would be in the right direction.

3369. If a proper field of practical instruction could be added and made available for the University, the men turned out might be of a very different quality to what they are now?—No doubt they would be improved.

3370. If you undertake to teach a man in any special subject like surgery or medicine or engineering, you do not expect that man when he has just left college to be a complete master of the practice of his science, do you?—No.

3371. He has had a preliminary training at a school or college, then he goes out into the world equipped with that training in order that he may learn how to apply it?—That is so, but still the medical hall and the infirmary are not very far separated.

3372. You would not expect a young doctor turned out after his course of five years at the University to be a complete master of the practice of surgery or medicine?—Certainly not.

3373. Similarly, after a forestry student has left the University where he has followed courses of various kinds, and has had practical instruction on the State areas that may be provided, but have not yet been provided for him, you would not expect to find him a complete master of the practice of forestry, would you?—No.

3374. But you think he would have had a training that would enable him to become a practical man in a relatively short time?—Yes.

3375. He has what will enable him to become a practical man in the future?—Yes.

3376. Hence, if you get a student who was at first rather at sea in practice, you would not necessarily think that that condemned him?—Certainly not; that is, in the proper direction. But I think there ought to be an out-and-out move in this question. Those are the lines which I believe are the important lines, namely, that you must have a great deal of practical teaching, and the scientific teaching going hand in hand with it.

3377. I am absolutely at one with you in regard to that. There is only one other point. You said a little while ago that the low rate of pay which is now given to foresters renders it very difficult for them to obtain a high-class training; do you think that if proprietors realised the great value that their woods might have if properly managed, this might have some effect in raising the remuneration of foresters?—Yes, I do think so.

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3378. It would raise the remuneration that it would be worth while for the proprietor to pay his manager?—Yes, I think so; but there are so many small estates.

3379. But still it would have that effect, taking it generally over the country, would it not?—Yes.

3380. Do you think that a State model area, in which all work would be done in the best possible way with a view to profit, which would be open to inspection by proprietors and others interested in forestry, and where accurate accounts of all expenditure and receipts were kept, would be likely to have any effect upon the proprietors in informing them as to the value of their woods?—Unquestionably.

3381. Therefore the provision by the State of a model forest, to be used for instructional purposes as well as to serve as an object lesson for proprietors and others, might have a very important effect both in training foresters and in raising their position?—Yes.

3382. (*Sir John Rolleston.*) I think you say that there are certain consulting foresters in Scotland?—There are a few. With all deference, it is only the intelligent proprietors who have availed themselves of their services here and there, just where they could be obtained and depended upon; but I think, after all, that they are the men who have obtained their information by the sweat of their brow, so to speak. They have gone into the thing on their own initiative, and made themselves masters, so far as they could, of their profession.

3383. There are none in England, I am sorry to say, that I know of. The wages of a forester on a small estate of course must be smaller?—Yes.

3384. But there is no reason why the emoluments of the consulting forester should not be very large?—That is so; they might be very good indeed.

3385. And if a class for consulting foresters of that sort were encouraged at the Universities it would be a very useful thing, would it not—men who would not take sole charge, but who would go and advise for fees?—Yes; no doubt such men could always be found, if the experimental area were first obtained and the seminary situated upon it. You would always find that the best man from such a place would be the one who had equipped himself in after years by extensive experience.

3386. (*Mr. Marshall.*) You stated that you thought Perthshire would be a very good place for a State experimental forest?—Yes.

3387. I suppose you would want, for the scheme to be successful, a certain amount of high land and a good deal of low land?—Yes.

3388. Would it not be a very expensive business to acquire a place of that sort in Perthshire?—I have no doubt it would be an expensive business.

3389. Most of the low land would have fishing on it—of course that would not interfere except to make it very high priced—and shooting rents are very high in Perthshire too, are they not?—Yes, they are.

3390. Have you any idea at all what an estate of 10,000 acres in Perthshire suitable for a State forest would cost?—It is very difficult to say, because I have not any particular spot in view. Offhand, I should say that a third of it should be good fair agricultural land, which would cost £1 an acre. I do not think 25 years' purchase for that would be too much. Roughly speaking, that would be about 3,000 acres. Then you would want 3,000 acres of medium ground, such as is generally planted in the semi-highlands at the present time, and the remaining 4,000 acres of higher ground. The medium ground I should put at, say, 10s. an acre, and the higher ground at 2s. an acre.

3391. Four thousand acres at 2s., 3,000 at 10s., and 3,000 acres at £1; you think it would be possible to buy a suitable area for that price on the basis of a 25 years' purchase?—Yes, but added to that you would require to put on the shooting rent.

3392. That would be another considerable item?—Yes, that would be something. For grouse rent over the 4,000 acres I should put at something like £750 a year if it were in a very grousy place. Then there is the valuation of the woods.

3393. That would make the whole thing rather expensive?—It would.

3394. Let me ask you one or two questions about the Royal woods at Balmoral. Have you done much in the way of forestry there, or have they been left alone?—We have done something within the last 10 years on the thick planting system, and the management for a considerable time has been considered by those who have seen it to be good. We have a considerable area of natural forest there which has been very little touched. It has been open to deer, and in consequence does not regenerate itself. Where there are large herds of deer and sheep it is well known that it is no use to attempt natural regeneration in such places.

3395. Do you think His Majesty takes much interest in forestry?—I am sure he does.

3396. (*Dr. Somerville.*) Speaking of this forest area that you suggest the State should acquire, you spoke of land of the value of £1, and also land of the value of 10s., an acre. I suppose that would be agricultural and pastoral land?—Yes.

3397. Would you suggest the planting of land which could be let for agricultural purposes for £1 an acre?—There are so many points to be considered. There is always the question of the quality of the land, such as good strong clay land or a mixture of clay and alluvial matter, and so on. It sometimes happens that even with land at £1 an acre a sufficient return may be obtained to warrant its being planted.

3398. Do you think that the profits of forestry in this country sometimes amount to a net return of £1 an acre?—Yes.

3399. I suppose you would have no scruples about thinking that land at 10s. an acre might often be planted with very considerable profit?—None.

3400. You have had experience, of course, of forestry at considerable elevations in Scotland: do you find trees in your district grow well up to an altitude of 1,000 feet?—They do.

3401. How high do you consider it to be profitable to plant trees in the highlands of Scotland?—It depends upon the height of the neighbouring ranges, but near the higher ridges of the Grampians they certainly grow profitably up to 1,500 feet.

3402. What trees would you consider to be most suitable for planting at these high elevations?—The native Scotch pine.

3403. You find that the native pine grows better at a high elevation than larch?—I do in the particular sites I am thinking of now; but, given a loose Silurian formation or any formation suitable to the larch, I do not say it does.

3404. Have you had considerable experience of so-called German larch as well as native larch?—Yes.

3405. Could you give the Committee any opinion as to the relative merits of German or Tyrolese and the larch grown from Scotch seed?—The result of my experience in that direction is most decidedly in favour of the Tyrolese larch.

3406. In what way do you find it surpasses the larch grown from native seed?—It is more vigorous, and less susceptible to disease.

3407. Have you ascertained that from your own experience?—I have.

3408. Can you illustrate your answer by giving us a specific example?—Yes; it is to be found on the Balmoral property.

3409. Where you have the two larches growing on practically the same kind of soil, and with the same exposure, the larch obtained from Tyrolese seed shows advantages?—Yes.

3410. I believe you are aware that many nurserymen talk in terms almost of reproach of Tyrolese larch?—That is so.

3411. You are then opposed to the prevailing view amongst nurserymen?—I am. I will give you one example, if you care to listen to me, with regard to that. I was taken once by a nurseryman who was altogether opposed to what he called my theory, and he showed me two beds of larch side by side, one from home seed and the other from Tyrolese seed. To start with, something like 95 per cent. of the Tyrolese seed had germinated, whereas but 50 per cent. of the home seed had germinated. He pointed to the apparent good health of the home plants as compared with the Tyrolese, which I admitted. That, however, was in the month of June. Early in the month of May there had been severe night frosts. The Tyrolese larch from its vitality had responded to the first impulses of spring

by sending forth its tender leaves; whereas the bark-bound nature of the acclimatised plant had stood still and refused to risk out, to be exposed to the late frosts. The consequence was that the Tyrolese plant was hanging its head from being nipped by the frost, but its bark was straw coloured, light and clean, and beginning to come away again, as compared with the stiff and stunted and less vigorous—less vigorous because less active—home plant. Then the same thing occurs in autumn. The Tyrolese larch grows on with vigour into the frosty season of the autumn, and gets its point nipped again; whereas the less vigorous home plant has got over its growing, and hardened off all right. But as time goes on, when the two plants are put out in the forest, the Tyrolese plant quickly gets over its reversals of fortune and moulds itself to shortened growth as it gets older; whereas the home plant, as a rule, becomes the subject of disease and blister, and dies off before it is half old. That is a summary in a few words of my experience, and a comparison of the two plants.

3412. Have you tried the Japanese larch at all in your district?—Yes.

3413. What is your experience of it so far?—It is hardy, about as hardy as the home larch, perhaps rather more so, I think, as regards spring and autumn frosts. I have seen no disease upon it yet, but the oldest plants I have are only about sixteen years of age, so that I cannot say very much about it.

3414. But sixteen years is quite a sufficient time to test its immunity or otherwise from disease? Have you found disease upon the Japanese larch at all?—Not at all.

3415. So that up to 16 years of age, in your experience, it is absolutely free from disease?—Yes, but my experience is not very extensive as regards Japanese larch.

3416. But still you have had a considerable number of plants under observation?—Yes; but it may become more susceptible to disease after a time. I hardly think it likely that we should have found disease in the Tyrolese larch so soon after its introduction.

3417. In other words, you think that the Japanese larch at the present time is occupying a position which may be compared to the position occupied by the common larch about the beginning of last century?—That is so in some respects, but not in all. I do not think it will ever be of the same importance, from its slowness of growth. It is certainly slower in growth than the native and Tyrolese larch after it is put out.

3418. Do you find that it starts more rapidly in youth?—Yes; it starts very rapidly in youth; it goes on equal to the European larch, but later on it seems to get more stubby, and to be of much slower growth altogether.

3419. Do you extend your opinion with regard to the relative merits of Continental and native larch to Continental and native Scotch fir?—By no means. I would rather put it the other way, in favour of the home article.

3420. Do you find that the seed obtained from the Scotch pine of your district produces better plants than the seed obtained from Germany?—I think so.

3421. A great deal of the land which, I suppose, you would recommend for putting under forestry in Scotland is at present under sheep, is it not?—It is.

3422. Is sheep farming in the Highlands of Scotland a very remunerative industry?—By no means at the present time, not nearly so much as it was in previous years—back in the 70's, 80's, and even the 90's.

3423. I suppose then that the condition is reflected in the rent of the land?—It is.

3424. Then rents have come down very much, I suppose?—Yes, and they are coming down still.

3425. Do you know what the rents of sheep farms in the Highlands run to per sheep?—I am not prepared to say that off-hand in a general way, but I think you may take it from 2s. to 5s. a head.

3426. How many acres of Highland sheep land does it take to carry a sheep during the year?—From one to two.

3427. Is there much land in the Highlands which can be stocked at the rate of one sheep per acre, or even one sheep per two acres?—I am taking land suitable for forestry; I do not take in the hill tops. Suitable sheep pasture land ought to carry that quantity, but not during the winter. Winter is the big thing.

3428. I am referring to keeping the sheep through the whole year?—The great majority of hill pastures cannot keep them in the winter time at all; they have to be sent away to winter.

3429. What number of men do you think 100 acres of land under various ages of trees would support?—That is rather a knotty question, and one to which I am not exactly prepared to give an answer. It would vary according to the quality of the land and the position. There is such a wide range in giving an answer of that sort.

3430. Very well, I will not press you upon it, but we were rather anxious to get information from men of local experience, such as yourself, with regard to the influence of the extension of forestry upon the population. Suppose a man had 1,000 acres under forests on an estate, how many labourers and foresters do you think that 1,000 acres would employ consecutively during the year?—Merely for the growing and exploiting of timber, independent of manufacture, it would easily employ ten.

3431. That is one man to 100 acres?—Yes.

3432. How many sheep would a 1,000 acres of ordinary hill land keep?—I am going to give you an answer in a general way, covering the whole thing on the basis upon which you seem to put your question, taking in the hill tops and everything else—about 500.

3433. Will 500 sheep give employment to a shepherd?—Yes.

3434. It comes to this then, that a thousand acres of ordinary Highland land would find employment for a man?—Yes.

3435. Whereas a thousand acres under trees would find employment for ten men?—Something like that. I think that would be a fair proportion.

3436. And that is altogether apart from the working up of the forest produce in the neighbourhood; your figure only refers to planting, thinning, and felling, and possibly does not include the dragging of the timber out of the wood, its removal to the saw mills, and still less does it include the labour that is required in the saw-mills themselves?—That is so.

3437. We may safely say, I suppose, that forestry would give employment for at least ten times the population that is provided for under a system of pastoral farming?—That would be a fair estimate. I think.

3438. What sort of quality do you find that the Scotch pine of the Highlands attains to?—Just as good as ever came from the Baltic.

3439. Do you consider, in fact, that the Scotch pine of the Highlands, grown under suitable conditions, is quite as good as the red pine of Sweden and Russia?—I do.

3440. Do you use much of your home-grown stuff in the erection of buildings on Deeside?—Yes, almost exclusively for some time back.

3441. I suppose you have not had that timber in the buildings long enough to see how it is going to last?—I know of some timber in some buildings at Montrose which is 300 years of age.

3442. So that you do not consider there is anything in the charge which is sometimes made that we cannot in Scotland grow as good pine timber as can be grown abroad?—I do not.

3443. And if the timber is bad, knotty, is open in the grain, and soft and spongy, that is a question of management, and not a question of soil and climate?—That is so, so long as you stick to the mountain ranges, and do not go down into the low-lying plains of clay, and so on.

3444. I suppose these low-lying plains are, for the most part, under agricultural operations, and are not really forest land at all?—That is so.

3445. (*Colonel Bailey.*) Were you at the Forestry exhibition at Inverness?—Yes.

3446. Did you see the timber which Sir Robert Menzies sent from Menzies Castle?—Yes.

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3447. Do you know that he says he has beautiful Scots fir timber which has been in the Castle for 300 or 350 years?—I believe that is so, although I had not that fact in my mind when replying to Dr. Somerville's question, but I thoroughly believe it.

3448. Now I wish to ask you a question about the Japanese larch. You say that the Japanese larch is free from disease up to about sixteen years of age, but that it has rather a stunted habit?—Yes.

3449. Do you know which species you have got in your forest—are they all of the same kind?—The only species I know of is called the *Larix leptolepis*.

3450. Do you think that you always get the *Larix leptolepis*?—I believe all I have is *Larix leptolepis*. I do not know that I have any other kind of Japanese larch.

3451. In Japan there are, I believe, five different species of larch, and I have heard it said—with what truth I do not know—that these species have very different habits, and also have heard it said that you do not always get the kind of Japanese larch seed that you want. Sir Robert Menzies I know claims that he has had the seeds of two perfectly distinct species sent to him under one name, and that one of these species grows up straight and tall, and looks as if it would produce a fine timber tree, whereas the other has a low bushy habit, and will never make a timber tree. Have you ever seen anything of that sort?—I cannot say anything on the subject at all. I can only say with regard to the *Larix leptolepis* that it shoots up very strong when very young, and then after, perhaps, five or six years, it gradually begins to shorten its growth until it gets much more stunted at sixteen years of age. While on the question of foreign trees I may say that I have a strong opinion as to the quality of the *Abies Douglasii*, the Douglas fir. I think it is going to be a fine tree in the country.

3452. (*Sir John Rolleston.*) You said that the Scotch pine, if grown under proper conditions, would give as good timber as Baltic timber?—Yes.

3453. But grown in the south of England, say the New Forest, does it make good timber?—I would not say that it is not perfectly good in such a soil as there is in the New Forest. The bare soil of the New Forest I have no doubt would produce excellent Scotch pine timber, probably as good as we have in the north, always provided that you clear off the bad atmosphere, that is the atmosphere charged with carbon, and the various dirts which fly about in a thickly populated country.

3454. Then it is a good timber tree to plant even in the south of England?—Yes, the soil conditions being good and the management correct.

3455. May I ask you one question with regard to the interesting evidence you gave about larch. The original larch was the Tyrolese tree, was it not?—It was.

3456. Therefore the seed of this Tyrolese larch now grown will deteriorate?—I have no doubt about it.

3457. It ought to be perpetually replenished by Tyrolese seed?—Yes, just as we ought to go back to the natural habitats of the Scotch pine for the seeds of the future—Strathspey, Deeside, and other parts of the Highlands.

3458. (*Dr. Schlich.*) You said, I believe, that your Japanese larch was free from disease?—So far as I have seen it.

3459. Where that Japanese larch is grown, have you any ordinary larch in the vicinity in a similar situation?—Yes.

3460. Is that diseased?—Within 12ft. of one plant I noticed three diseased, blistered plants with the aphis upon them, too.

3461. But not upon the Japanese?—The Japanese are untouched.

3462. Your own private opinion is that in all probability bye and bye we shall have the same misfortune with the Japanese larch that we have now with the ordinary larch?—That follows.

3463. That is your personal opinion?—Yes, that it will probably happen.

3464. Perhaps it will interest you to know that the disease has been found on the Japanese larch certainly in two undoubted instances. At the same time it has been noticed that when the Japanese larch and common larch are together the disease generally attacks the common larch before it attempts to attack the Japanese?—It is interesting to know that.

3465. (*Chairman.*) You have given us some evidence about larch. Does not the frosting of larch in the nurseries often occur through the nursery being placed in too warm and sheltered a position, facing the sun?—Yes, in too frosty a position, and too level and flat. It frequently occurs that the site of the nursery is very badly chosen in that respect.

3466. It is chosen rather as a forcing ground than as the best site for the young trees?—Yes, very frequently.

3467. Do you think it desirable to have experimental stations in which experiments, for example, connected with larch disease, could be carried on, and tests made of the various mixtures with which larch may be grown in order to keep it more healthy?—Yes, I think it would be very interesting, and very valuable in fixing proper lines on which to grow the plant, and from where to get the seed.

3468. And that can only be done by the State or some public body in order to ensure the continuity of the experiments?—I should say that was the case.

3469. Have you had any experience of natural regeneration?—Yes.

3470. Do you think it is sufficiently practised in Scotland?—No.

3471. In answer to Dr. Somerville you gave your opinion, generally speaking, as to the population which could be maintained in the Highlands by forestry as compared with sheep farming, and your estimate was based solely upon the growth of the timber: Are you of opinion that with a full crop upon the ground—which we very seldom find, it is true—with the sawing, milling, creosoting, local orders, building, a certain amount of carpentry work, utilising the hard wood by band saws, and so forth, that the same population, if not, indeed, a larger one, could be maintained by manufacturing the wood than even by its growth?—I should think that would be so, that even a larger population could be maintained by the manufacture than by the growth.

3472. I have no figures of my own, but that is rather my experience?—Off hand I should say that more would be maintained by the conversion of the timber than by its growth.

3473. Knowing the Highlands well, and probably also what has been for some years known as the Highland land question, are you satisfied that the extension of forestry is perhaps the most effective means of solving any land question of the Highlands by giving this larger employment to labour?—I am very strong on that question: I think it would be the most effective means.

3474. And you think you would raise the status of the inhabitants of the poorer districts effectively by the extension of the wood-land system?—I think so; I have no doubt about it.

3475. Do you think there is a very large area in the Highlands which is available for profitable afforestation?—Yes.

3476. And that it is a purpose to which a great extent of the Highlands could be most profitably put?—Yes, certainly.

3477. Have you any idea of what sort of proportion of the heather land in Scotland could be properly afforested for the growth of timber?—I have not gone into that, but there certainly would be a very great proportion of it if you excluded the grouse and the deer idea. I have no doubt that something like three-quarters of it would be available for forests.

3478. Although grouse rents are high now-a-days, and deer rents in some cases bring in something also, you think that the returns from forestry would compare favourably with the sporting rentals if the woods were once properly managed?—Yes, of course, looking a great number of years ahead.

3479. There would be an immediate loss?—Yes, a very considerable loss for many years to come.

3480. Do you think it will be done largely by private owners, or are you of opinion that if it is to be done you would have to look to the State for support?—Private owners have already scouted the idea for these very reasons, and we should certainly have to look to the State in the matter.

3481. Then you would look to a large proportion of the Highlands being covered by State forests?—I suppose that would be natural.

3482. (*Dr. Schlich.*) Do you think that if the lower parts, or a considerable proportion of the lower parts of the deer forests in the Highlands were under forests,

that this would in any way interfere with the shooting rents?—I am afraid it would.

3483. Why?—Because it interferes with the stalking so much.

3484. Is the stalking done very much in the lower parts?—The stalking is the great thing in deer shooting in this country.

3485. Stalking would be interfered with even in the lower parts—I am not speaking of the higher parts?—It depends upon the proportion. The belts of wood in the lower parts would not be affected—as a rule we already have belts in the lower parts, but not in all cases—but generally speaking, where there are deer forests there are some patches of wood on the lower ground.

3486. Do you think the very extended planting up of the lower parts would interfere with the rents?—Yes; to plant up even the lower parts of the deer forests to any great extent, say one-third or one-half of the total area, would interfere I have no doubt with the rents. In the first instance it would, from the deer having to be kept out of the area altogether.

3487. Not for ever?—No; but altogether for the first ten or twenty years.

3488. (*Chairman.*) Probably the loss involved in the deer rents would be best mitigated by planting by degrees, and opening up the woods as soon as they came to a height where the deer could do them no harm?—Yes, that is so.

3489. And in that way eventually I suppose a considerable portion of the lower parts of the forest might be planted without loss of rents?—Yes, that is the case, but not to any great extent.

3490. If it were done sufficiently slowly?—Yes. As you put it, the loss would be mitigated by that, but the rent certainly would not be so good, because stalking is the great thing. I have frequently heard sportsmen and, what is almost of more importance, the gamekeepers or deer foresters, go dead against large planting.

3491. You are aware that some woods at Beaufort are let for a considerable sum for deer shooting, but at the same time we all know great rents are given for the bare hill?—Yes, for the open hill where they can stalk.

Professor H. MARSHALL WARD, D.SC., F.R.S., called; and Examined.

Professor H. M. Ward, D.SC., F.R.S.

3492. (*Chairman.*) I believe you are a Fellow of Sidney Sussex College, Honorary Fellow of Christ's College, and Professor of Botany in the University of Cambridge?—Yes.

3493. And you have been nominated by the University of Cambridge to give evidence here?—Yes.

3494. Can you give the Committee your opinion as to the suitability of Cambridge as a centre for forestry instruction?—It seems to me the want of forests in any extensive sense would be felt in any teaching of forestry pure and simple, but in other respects it would appear that for the instruction in subjects on which forestry depends, Cambridge might be an admirable centre. There is already a course of instruction in the sciences on which agriculture is based, and I think we may say it is a successful course, and many subjects that would be necessary for forestry would be the same as those that are necessary for agriculture, so that for a large proportion of the subjects, the sciences on which forestry is based, I should say that Cambridge is admirably suited as a centre for instruction.

3495. I think your view is, that with the appointment of a lecturer on forestry at Cambridge the theoretical teaching would be complete there?—The theoretical teaching may be said to be complete, or could very easily be rendered so.

3496. Is it your view that students at Cambridge could best obtain their practical instruction on forests on the Continent, or by endeavouring to establish a forest garden or a forest area in the neighbourhood of Cambridge?—It has often appeared to me that a forestry school could grow up with a forestry nursery or a forestry garden, and it seems a pity to go abroad, since there could easily be established within reasonable distance of Cambridge young forests in a short time. If the question of going abroad is raised, why should we go to the Continent? I think that in Scotland, for instance, and in many other parts of England, it would be possible to find a forest that would answer for the purposes of illustration.

3497. You would probably consider that some of the forests on the Continent are better grown than the forests in this country?—Undoubtedly. Forestry in Germany and in France has been practised for so long a time on well-known lines that the art is there as near perfection as it can be.

3498. Would it be possible to establish a model forest or a sufficient forest garden in the neighbourhood of Cambridge?—I have my doubts about the immediate neighbourhood of Cambridge. Cambridge is one of the driest counties in England, and it would need experts in forestry (I am not an expert in the practice of forestry) to decide that question. I believe doubt has been expressed as to whether forests could be readily grown on a large scale near Cambridge.

3499. Is there any land in the neighbourhood belonging to any of the colleges or to the University which could be acquired for that purpose, say within 10 or 15 miles?—I am not accurately informed on the subject, but my impression is not to the effect that it could.

3500. But you think that with a forest garden in the neighbourhood of Cambridge, such as they have at Giessen in Germany, you would have sufficient practical demonstration in order to make the forestry course there a success?—Not if what is wanted is a complete forestry course, but for the teaching of the principles of what we call forest science it ought to be possible to make it quite a success.

3501. In conjunction either with tours abroad, or through the woods at home, the course would be complete?—Yes, there is no reason why it should not be made complete.

3502. And if you did not find sufficient provision in the woods at home it is practically easy to get abroad from Cambridge?—Oh yes, there is no difficulty in getting abroad from Cambridge.

3503. For the encouragement of forestry we have had a good deal of evidence that it would be advisable that the landowners of the country, the younger landowners, and those who are likely to become such, should receive forestry instruction. Would not either Cambridge or Oxford be very suitable as a centre for directing the attention of those connected with land to the science and the practice of forestry?—Yes.

3504. Probably landowners and land agents would find Cambridge and Oxford the best centres at which to study?—Yes, and if I may express my opinion I should go further than that. There are many young men who come to Cambridge who are studying sciences of the kind we are considering, who have no very definite views as to what their future life will be; I believe if it was understood that there was such a career as that of a forester or a land agent in the sense of a forester, many of them would be interested in it, and probably some would take it up as a definite profession.

3505. Would it be possible to work in the theoretical instruction at Cambridge with a State model forest situated in a locality more favourable for the growth of trees, at no considerable distance from Cambridge?—I think so, though it has always appeared to me that there are some advantages (I do not say there are no disadvantages) in separating the theoretical part of the training of a forester from the technical pursuit of his art afterwards. May I put it to you in this way, that he is afterwards applying knowledge he has learned, say in Cambridge, and in that way it would be possible for the technical school at a distance, to select men who had shown themselves really well adapted for the purpose?

3506. Then you would desire that they should complete their training for forestry in some forest school or State model forest?—In the forest itself, I should suggest.

3507. (*Dr. Somerville.*) I suppose that you regard forestry as an important department of rural economy—that is to say, as an important means of developing the financial side of a landed estate?—Distinctly.

3508. I suppose perhaps on the whole you would not place it on quite such a high level as agriculture?—From the point of view of the private landowner per-

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haps not, but from the point of view of the State I think I should.

3509. Perhaps you would express your view as to whether you think forestry offers any special advantages as compared with agriculture from the point of view of State ownership?—It seems to me that there are many large tracts of land which could never be put into agriculture pure and simple unless really paying prices prevailed, and were such as to encourage the conversion, and that could only be over certain shorter or longer times. Land of that sort could very well be planted up, I understand, with trees, and if properly done, if done with a view to a steady and slow future development, as is done in Germany, with the thoughts many years ahead, and the conviction that whatever directions were given would be faithfully carried out, it seems to me that under those circumstances very valuable properties might gradually be developed in this country.

3510. There is in Cambridge at present a department of agriculture, with a Chair: would you suggest that a Chair of forestry should be created?—A Chair of forestry seems to me going too far, if by forestry is meant the technical instruction in forestry, because I think a professor of forestry who was hampered by the want of forests in his immediate neighbourhood, and large forests, must really feel that he has not his workshop at his hand, he has not the appliances that he really needs. If I felt sure that he could obtain forests sufficiently near for him not to feel that inconvenience, it would seem to me immaterial whether he is called a reader, a professor, or a teacher. But I think, from any immediate prospects in Cambridge, he is not likely to be able to find what he really would want at his right hand, as it were.

3511. You have acquaintance with the forest school at Coopers Hill, I believe?—Yes.

3512. The forest school at Coopers Hill, as I understand, has no forests under its immediate control, and yet I think the country as a whole is agreed that the forest school at Coopers Hill is quite successful. Do not you think the condition of things at Cambridge is very nearly analogous to that which prevails at Coopers Hill?—I should not have thought that. At Coopers Hill, I believe, in the first place, it is not quite accurate to say, is it, that there are no forests under its immediate control? There are, I believe, tracts of forest at Coopers Hill which are under the control of the Professor of Forestry. (*Dr. Schlich*: They were till a year ago.) I did not know any change had been made. I understood they were under such control; but even if they were not so, it has always appeared to me that the immediate proximity of a large area of forest which we generally call Windsor Forest, and Windsor Park, is an enormous advantage. Coopers Hill is in the middle of a large forest area. I do not think we could describe Cambridge as being anything like so well situated in that respect.

3513. There may be practical difficulties in the way, but I suppose, at any rate, it is a subject that might with advantage be debated as to whether it would not be desirable to concentrate even the highest forms of forestry instruction, such as are at present given at Coopers Hill, in Cambridge?—Certainly. Personally, I should feel that the more technical parts of forestry offer difficulties which might possibly be got over in debate, but I think many people would feel that the purely technical part of forestry is not a subject for university education.

3514. Yet I suppose we have cases on the Continent where forestry gets more attention than it does in this country, where forestry is taught in its highest forms in a university detached altogether from forests?—True. Of course, the conception of a university abroad and in England is not always the same.

3515. You have acquaintance with the University of Munich, have you not?—Yes; I have a visiting acquaintance. I have been once or twice to Munich.

3516. And Munich is regarded, is it not, as an excellent type of the highest developments of forestry education?—Undoubtedly.

3517. Yet there are no forests under the control of the Department of Forestry in the University of Munich?—Is that so? I was not aware of it.

3518. Is it your impression, then, that the education in forestry at Cambridge should only go to the length of being supplementary to the general education that you consider it desirable to impart to the prospective landlord or land agent?—I should not like to call it supplementary—that does not seem to me the right description—I should call it fundamental. It is the education that is to prepare a man for the very serious profession of forestry.

3519. What I mean by supplementary is this, that perhaps you would not consider that Cambridge was qualified to turn out forest experts, men who were going to make a profession of forestry, on account of the difficulties in the way of technical training?—But they are not yet ready.

3520. But do you think they could be created if the impulse were given?—Certainly. Judging from what we have seen of the agricultural School, I think we might even have men enthusiastically ready to become trained foresters.

3521. You have acquaintance, have you not, with the land within twenty miles of Cambridge?—As a botanist, not, of course, as a forester or an agriculturist.

3522. I suppose it would not be difficult for the University, if the funds were forthcoming, to obtain a certain area of that land as a demonstration plantation?—I think probably not, though I know nothing of details as to any land being available.

3523. In a general way, I suppose, you know that some land not very far from Cambridge is of low agricultural value?—Yes, certainly.

3524. And that so far as the rent is concerned, it would fairly come within the definition of suitable forest land?—Yes. I think we ought also to remember that Cambridge is a chalk and clay county, with the exception of the extreme west—the small border near Potton.

3525. Perhaps you also know that near Woburn there are extensive plantations where the trees appear to grow thoroughly satisfactorily, and which, as a matter of fact, are under systematic management; do you think these forests at Woburn are sufficiently accessible to serve as demonstration objects for any instruction that might go on at Cambridge?—It would be impossible for me to say. I can only remember that Woburn is not on a direct line from Cambridge. Is it not the case that you must go by the London and North-Western line, and then change?

3526. You do not require to change. I think it is about an hour and a half by train from Cambridge?—We are perhaps prejudiced against the line, as we regard the trains as slow, but I cannot say anything that would be of value, I think, with regard to that.

3527. You are quite clear on this point, that if a man is going to prosecute the profession of a forester, or a forest expert, he must have the opportunity of acquiring at least part of his education in a natural practical forest area?—Yes. It seems to me the position is exactly parallel to my own position as a botanist. Without my laboratory I could not possibly work. The forester without his forest is in the position of a botanist without his garden and laboratory, or a chemist without his laboratory. The forest seems to me to be absolutely essential to the forester.

3528. You have, I know, written a good deal upon the application of botany to forestry. No doubt you are aware that the particular mixture of trees is an important consideration in forestry, and that the management of the woods afterwards naturally divides itself into various systems. Without suggesting that it might be possible to acquire three or four thousand acres of land for a forest in the neighbourhood of Cambridge, do you think that these various systems and methods of grouping and even processes of management might be fairly demonstrated upon comparatively small areas within easy access of the class-rooms in Cambridge?—It is impossible for me to speak with any certainty in regard to that, but my impression would be that model illustrations of systems of planting could be devised.

3529. Suppose the recommendations of this Committee were in the direction of the development of forestry instruction in Cambridge, do you think the funds at the disposal of the University are sufficient to carry out such recommendations?—I do not think there

are any funds that could be applied directly to the foundation of a Chair in Forestry.

3530. Or even as regards the support of the lectureship?—No, not to my knowledge as regards even the support of a lectureship. I may say that within the last few years Cambridge has often founded, at quite short notice, small teaching positions, lectureships, and so forth, but I think it should be clearly understood that these are not calculated to attract anyone from a distance. As a rule the remuneration is small, £50 or £100 a year, to encourage some young man to interest himself further in the subject.

3531. But if the funds were available, do you think the University would offer any obstacles in the direction of the development of a forestry education?—On the contrary, I should think that for the extension of the necessary botanical and scientific teaching the University would quite welcome such.

3532. You, I believe, are at present obtaining large additional buildings for your Department, are you not?—Yes.

3533. Forestry, in certain of its aspects, is very closely related to botany, I suppose?—I think so.

3534. Have you any idea about the development of an economic Botanical Museum, giving special attention to forest products?—There is no special provision for that, though my own intention is to place in the Botanical Museum such illustrations of forest products as we have, and I hope as years go on that that will extend.

3535. Within the limits of your own Department, would you be prepared to encourage the study of botany as affecting forestry?—Certainly.

3536. (*Colonel Bailey.*) You have said, I think, that if a course were established at Cambridge a good many men might possibly attend it?—Yes.

3537. Do you think there is a fair prospect of men attending it?—The actual number of men in the Agricultural School is about 30.

3538. What do you think the aims of the men attending the school would be; do you think they would attend solely for the purpose of acquiring education in forestry, or do you think they would take that course of study as a sort of extra subject along with other things?—I think they would go with the definite intention of taking forestry—if there was such a course in forest teaching—such as would lead to its practice as a profession.

3539. Do you think that a number of other men perhaps could attend, too, who did not come up specially for forestry—but for arts or something else—and who would take forestry in addition?—Yes, certainly.

3540. For instance, the sons of landowners, who perhaps might some day be landowners themselves, and who wish to gain some knowledge of the subject in connection with the management of their estates?—Yes, I think that the sons of landlords, men who have some means and intend to travel, and that those who intend to pursue a definite course of forestry, might be represented in a few years.

3541. You suggested just now, I think, that the teacher in a university, whoever he might be, would want a workshop at his hand. By that you mean, I suppose, a field of practical instruction?—Yes.

3542. That would be an essential?—Yes, I think a forest would be an essential.

3543. There is no forest at the present time in the neighbourhood of Cambridge, I think?—I do not think we can say there is a forest or any woodland that we could fairly describe as a forest. I think perhaps Professor Somerville might help us there, but I do not think we can call any tract of land within 10 miles of Cambridge forest.

3544. If you got a tract of land, and began to stock it for this purpose, you would only have young woods for a very long time?—Yes.

3545. And that would hardly be sufficient for your workshop, would it?—It would not be a complete forest.

3546. It would not be sufficient in itself; you would have to go elsewhere to see other things?—True.

3547. Do you think that the men attending this course would readily go elsewhere? Do you think you could send them, for instance, to Scotland or Germany, or other foreign countries, in order to see what you have not the means of showing them at home, but which is essential to their proper training?—It is impossible to say, as we have never tried it. We have, of course, very small local excursions in my own subject, but that is hardly to be compared with excursions where a man would be away for a month or so. But we find, as a matter of fact, that young men go to Germany and France in their third year, in the long vacation, and study in laboratories, and I think the amount of enthusiasm that is not uncommon in other branches would be forthcoming also if there was confidence in the course of forestry training.

3548. You think there would be no difficulty in giving them the instruction somehow or other. If you could not give it to them locally, you would manage to get them on the ground somewhere else?—I think there would be difficulty; but the difficulty would be such as could be got over by enthusiastic and experienced men.

3549. You are aware, I daresay, that in connection with all, or most at any rate, of the Continental forest schools there are forests attached to the schools as fields of practical instruction, the forests being under the control of the directors of the schools—That was my impression.

3550. The object being to enable the students from time to time during the course of the lectures to be shown what has been spoken about in the lecture room?—That, I think, is of great importance.

3551. It would be rather difficult, would it not, to give effect to the instruction if you had not a forest with trees of all ages and crops of all kinds within accessible distance?—Yes. May I emphasise my previous remark, that I think that would be of importance, by saying that is what I meant by saying the forest is the laboratory of the forester.

3552. You said that you have an agricultural course at Cambridge. Have you a model farm for the practical illustration of agriculture?—Yes; we are very fortunately situated in that respect. We have had a farm placed at our disposal under very advantageous terms, and it is being used, I understand, as a farm for instruction, and I believe I am quite right in saying it is quite adequate for the purpose.

3553. I see that at the end of your statement you have given a syllabus of what you suggest might constitute a course of forestry?—Yes. (*Appendix XVI*).

3554. It contains a number of things—botany, sylviculture, the formation of woods, planting, selection of species, measurement, yield tables, forest utilisation, and forest protection. That would not form part of the ordinary training of a botanist, would it?—No. The course I sketched as a possible course to be completely followed in Cambridge is of such a kind that the parts I have called Part I. and Part II. could be done in Cambridge, and the forestry pure and simple could be done elsewhere. I should like to say that I am not speaking as a forester. In fact, I ought to have put in my syllabus that I have practically taken this schedule of forestry from Dr. Schlich's course as an illustration of what would be possible, not necessarily of what I think should be taught.

3555. I asked that question because I notice that you say that a forester's training should be essentially that of a botanist. It struck me that all the things I have mentioned do not form part of the training of a botanist at all?—May I say that I adhere emphatically to that opinion—that the training of a forester should be essentially an extension of his training as a botanist.

3556. The subjects I have mentioned would hardly come into a botanist's education at all, would they—the formation of woods, planting, sylviculture, etc.?—They are an extension of his knowledge of plants in a technical sense. They do not come under the head of botany.

3557. It would not be part of the training of a botanist?—Not of a botanist pure and simple. I have put it under Part III., and under another head, "Forestry."

3558. You do not suggest that the forester's training should be essentially that of a botanist, and that these subjects are of less importance to him than botany?—No; in their relative place. Perhaps I may put it in this way—that every botanist would not make a

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forester, but a good forester is impossible unless he is a botanist.

3559. (*Dr. Schlich.*) You said just now that it is impossible for a man to be a good forester unless he is a good botanist?—I think so.

3560. How far would you go in that direction? What do you mean by a good botanist from the point of view of a forester?—In the first place he should know the trees of the forests that he is dealing with. He should know a good deal about them, such as he can only learn as a botanist, and he should have that training in botany which enables him quickly to learn similar things about other trees that come within his practice. Then he should have those habits of experiment and observation which he learns so necessarily as a botanist.

3561. Do you mean that he must have a very considerable knowledge of systematic botany?—A selected knowledge, but it must be as good as an agriculturist's knowledge should be.

3562. Do you think that such a scheme as you have been good enough to put before the Committee might be developed at Cambridge for the education of foresters who would find their occupation in this country, or have you anything else in view?—I had essentially in view forestry anywhere in the Empire, but I confess that I did not formulate that view to myself very clearly.

3563. For instance, a forester would go out to a colony, or he would perhaps go to India. He could not possibly get on unless he had a considerable knowledge of systematic botany?—I think so.

3564. But for a forester who is to work in this country do you think this theoretic knowledge of certain parts of systematic botany is quite so essential as it would be to a man who goes to the Colonies or to India, because probably he has only to do with a very limited number of species?—May I put it in this way: that the man who stays in England should know certain facts about certain trees, but the man who went to Ceylon or to Jamaica, for instance, would have to learn similar facts about other species. In other words, what I mean is that whichever part he is going to, he must learn his work properly and thoroughly.

3565. No doubt; and a forester without some substantial knowledge of botany, of course, is not conceivable; but what I want to know from you is whether a great amount of knowledge of botany is required by a forester who is required to practice in this country?—I think the amount of knowledge referred to here is distinctly necessary. Without going through it, my impression is that there is nothing I have put down in my statement which I should like to see omitted from the instruction in botany.

3566. You are looking at it from a somewhat different point of view. For instance, in the detailed syllabus, in the outline and sketch of the forestry course, you deal first of all to a very great extent with general botany. I see that you put down the elements of histology, anatomy, and the physiology of the flowering plants. Then in the special forest botany the details of the syllabus cover two pages; you have the greater part of a page dealing, for instance, with diseases and injuries due to higher parasites, etc., and also to fungi, and you go into considerable detail there?—Yes.

3567. Do you consider that a forester practising in this country ought to have a thorough knowledge of the subjects which you have enumerated there?—Yes, I think that a man who has charge of an important area of forest in this country—that is to say, a chief forester—ought to know those subjects thoroughly, and not be merely acquainted with them. He ought to have been properly trained in them.

3568. How long would it take him to acquire a knowledge of all those subjects which you have entered here under the heads of "Botany" and "Special Forest Botany"?—Two or three years; not less than two and not more than three years.

3569. You also admit that that would only be the botany. You admit, although rather in the shape of an appendix, that a forester should also study some other things. For instance, he ought to study experimental physics, and mechanics, chemistry, geology, and entomology. On the same scale it would take a considerable time, would it not, to study these things?—I am afraid there is a slight misconception. What I have called Part I. and Part II. here are a two or three years' course.

3570. Do you mean that that would include all these things—experimental physics and mechanics, chemistry, geology, and entomology?—Yes. It is being done now at Cambridge. If we read for the present purposes, instead of "Forest Botany," "Agricultural Botany," it is being done in Cambridge now, and that quite successfully.

3571. Do you mean to say a student could master all those subjects in a three years' course?—He could have a very good training in them.

3572. You also admit that over and above that he would require some training in forestry proper?—Undoubtedly, before he could become a skilled forester.

3573. Of course you have a considerable acquaintance with this special forestry subject, but are there not a good many other things to be considered there? For instance, there are forest soils and certain peculiar relations of trees to soil and climate. Then there is the question of the protection of the forest against injuries by insects and against meteorological and atmospheric influences. Then there is the organisation; and amongst other things you have to learn mensuration, and to do a good deal with statistical data, so as to be able to develop the most profitable system of management. The forester will have to make financial calculations in order to find out whether in certain conditions forestry will pay, etc. He will have to determine the method of treatment, the selection of species, etc. He will have to learn to determine the yield of a forest based on a great many statistical data and tables—in fact, learn how to lay down the management in a satisfactory manner. So that if a student takes three years for the first part of the training, do you think you ought to allow less than two years for the rest?—I think it is quite probable that the technical and other part of the forestry would take quite that time in order to place him in a similar position in regard to agriculture in that respect. We made the same compromise with agriculture.

3574. I only want to get at your ideas. As a matter of fact, do you think I go too far if I say that the whole of this study, in order to bring it to a successful conclusion in every respect in which you have pointed out, would practically involve a course of five years?—Yes; because could not parts of this be dovetailed in? With regard to the actual teaching of forestry I am going beyond my own knowledge, but in agriculture they make this compromise.

3575. Do you think that these subjects which you enumerate as the foundation for the whole subject would take a course of three years?—I think the elementary science parts would take at least two years, and that the students might then begin the forestry. I think you are perhaps right in saying it would take two years.

3576. You say that it would take a course of three years for the first part?—I do not put three years as the minimum; I say two or three years.

3577. For an average student?—Yes.

3578. Anyhow, for a complete course it would take something like four or five years. I do not think you could do it in less than that?—If Part III. followed on Parts I. and II. it would take that time, but I think they might begin before.

3579. But you say in one place particularly, although I was not quite clear on the subject, that a forester's training should consist of two parts—"first, education in the principles of the sciences named; secondly, the technical application of the knowledge and thinking power thus acquired to the practical problems of the forest." Then you go on to say the first part can be carried out at school and at the university; the second only in the forest; so that a considerable portion of his education would follow the education at the university?—Yes, certainly.

3580. Then we could not possibly put it at less than four years, or possibly five years?—I do not think it need necessarily be four or five years; at any rate, not more than four. It could possibly be arranged in less, in three years.

3581. Would four years be a satisfactory solution to you?—I really cannot say whether it would take four years. It would take for the part that should lead to a forester's technical education at least two years; it may be three.

3582. It would take a good man two, and the average

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student perhaps three?—A good man might do it in two years, but the average student might require more.

3583. There are two more points I wish to bring out connected with this syllabus. There is considerable detail given of botany, and mention is also made of chemistry, mechanics, physics, and geology, but it is rather put behind botany. Do you not think that these things, in order to be satisfactory, ought to precede the study of botany. Are not the higher classes of botany based on chemistry and a knowledge of physics, and even soils, and that sort of thing?—Certainly; but we find, as a matter of practical necessity and convenience, that in a university course—for instance, in the sciences of agriculture—the man takes three or four of these subjects at a time, as is done for the tripos. Of course, in putting a scheme in line it looks as if most subjects followed after something else; but they can go slightly parallel.

3584. But the study of botany ought to be started after a certain foundation in chemistry and physics has been laid. At any rate it is easier afterwards?—Yes; we find, as a matter of fact, that very many students who take botany and pursue it a long way, have already done a good deal of chemistry and physics at school, at a school like St. Paul's, for instance, or one of the public schools. They come up to us already knowing something, and they go on with their chemistry and physics at the university.

3585. Then, in your syllabus you give all the details of botany, but you pass over practical entomology in one line?—True. I think I have said somewhere that possibly others would help in drawing up a syllabus. Naturally, I did not feel that I could do more than indicate the heads.

3586. We have had it in evidence here from a very competent authority that the study of entomology is at least as important as the study of botany,* and we have had important evidence that the damage done to forests, for instance, by insects, is considerably greater than that done by fungi. Do you not agree with me that the study of entomology ought to be treated at least as completely as the study of fungi, etc., of which you give a considerable amount of detail here?—I am surprised to hear that opinion stated, because it appears to me that, after all, the duty of a forester is to rear and to govern trees, as it were. I should have thought that that was his central object of study; to know the living organisms that he was going to control all through their life, lasting through periods longer than his own life. It seems to me that the trees, the plants are the principal things. It would be a very delightful and useful thing if he knew as much as he could of entomology, but I cannot imagine that that can be looked upon as the primary subject, as is botany.

3586.* The point is this: If he means to do justice to the growing of trees, he must study all the causes which are likely to interfere with the successful production of those trees, and the point at issue at the present moment which I put before you is that the injuries which are likely to occur to individuals under his charge are much more likely to be those caused by insects than those caused by fungi, and therefore it seems to me that a study of entomology is at least as important as the study of fungi, because these insects, especially these injurious insects, will live on those individuals which the forester has under his charge and interfere with them?—Yes.

3587. If that evidence is correct, that at least as much damage, and probably much more damage is done to trees by insects than by fungi, do you not agree that students ought to be as well instructed in entomology as in the attacks of fungi, etc.?—Yes, as thoroughly instructed. It is possible we do not mean the same thing by "thoroughly." Of course, the number of facts that a man must know in any subject must be dealt with by those who are organising the same; but I think the student must know both the subjects very thoroughly indeed, and as much as possible of both.

3588. There is another point which I should like to draw attention to. I have already touched upon the subject in a preliminary sort of way. Do you not admit that there are a great many questions connected with the subject of special training in forestry which could only be solved under the head of mathematics?—No doubt that is so. I am afraid I cannot express an opinion of any great value, but it has often appeared to me that many measurements and so forth could be solved by simpler methods than are sometimes used. But that is only an opinion.

3589. Are you aware of the fact that one of the leading authorities on botanical questions in this country has, at a public meeting not more than fifteen months ago, said that Englishmen will not go in largely for forestry unless it was demonstrated that it would return 4 per cent. on the capital invested, and further that only yesterday we had evidence from a most competent authority to the effect that the financial aspect in the last resort will govern the forestry question?—I do not quite understand the bearing of the last statement.

3590. It means that the financial aspect of the whole business will govern the question of whether we shall have more forests or not. If that is so, forestry students must acquire, at any rate, a certain knowledge of mathematics, and a sort of mathematic sense, as I call it, to deal with mathematical questions up to a certain degree. If that is so, would not that add another substantial part to your syllabus; because you do not mention a word about mathematics at all in any part of the syllabus?—True. I am afraid I can do no more than express, as it were, an individual opinion. I have often felt with regard to measurements, as far as I understand them in questions of land and forestry and of agriculture, that simpler methods could be used than are sometimes adopted. It seems to me that these are practical questions that a man with an elementary knowledge of mathematics and a really intelligent knowledge of how to use squared paper and a few mathematical instruments, could get at by very much easier methods than by the complicated formulæ which involve a knowledge of higher mathematics.

3591. We need not go into higher mathematics; only fairly high. If you want to study the laws of increment, which is dependent to some extent on botanical considerations, but is also dependent on a great many other considerations, and production on a large scale in an economical manner, so as to determine the methods which are likely to lead to the greatest quantity of useful produce in the long run, you cannot do that unless you have a certain knowledge of mathematics and a mathematical understanding. We are now coming to the crux of the business. After what most competent authorities, who are acquainted both with botany and forestry, have stated, and considering that the mathematical aspect of the whole business is of the utmost importance to the final success, apart from the knowledge of other branches of science, do not you think that there is really something more in forestry than botany, or the application of botany?—I am perfectly prepared to say that there is a good deal more. I think I am only advocating that a botanical training should be very real, and that it should run on the lines that I say—that it should be taken as the serious foundation as regards the scientific training for a forester. I do not say that a forester is to be a botanist and nothing else. It seems to me that he must have a great deal of knowledge in other directions.

3592. You agree with me, as a matter of fact, that a good knowledge of botany is really the foundation† on which he practically builds up afterwards his own profession?—Yes, I think that is my position.

3593. But only the †foundation?—It is the most important of the fundamental sciences.

3594. I now come to the expression of a very great authority—a gentleman who was made a Fellow of the Royal Society for his botanical work. He says: "My best friends, men who take a deep interest in the welfare of the British Empire, measure the success of forest administration in India almost entirely by the net annual revenue which the forests yield. When the revenue diminishes, as was the case some years ago in the Central Provinces, such a decrease is regarded as certain evidence of bad forest management." Again he says: "These friends of forestry ignore completely that mathematics, chemistry, meteorology, and geology are

* Dr. Schlich wishes to state that if he used the word *botany* this was a slip, as he meant to use the word *fungi*.

† Dr. Schlich does not think that he has been correctly reported. He intimates that he used the words "*one of the foundations*," and not "*the foundation*."

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fully as important to the forester as botany"; and I add thereto, amongst other things, entomology. I do not want to be misunderstood. What I wish to point out is this, that a thoroughly competent forester must have a considerable knowledge of botany; but, after all, it is only one of the foundations upon which he builds up his knowledge of forestry and forest management in the long run. Do you agree with me there?—No, not quite. I agree with you in principle. I do not think there is any fundamental difference between us. It is only as to the quantitative meaning of terms. I should say that it is essentially a botanical training that a forester needs upon which to build up the practice of his art or craft. Even to be a very good botanist he must know a good deal of elementary physics and chemistry. That is always recognised. I quite agree that the other subjects mentioned have their importance, but I think their importance is relative. I do not think this only because it is my profession. I am convinced that botany is the most important subject, though of course I may be biassed in that respect. I should like to say, with regard to the other things—with reference to the definitions of forestry—that I once heard it said, also by an eminent man, that forestry was essentially a branch of mathematics, a statement which I confess was always to me of the nature of a sort of paradox. I do not think that it is a good definition of forestry.

3595. Considering that the whole success of forestry depends on the financial results, do not you think that mathematics has a great deal to do with it? Do you not think that is logical?—Is it the practice of forestry, or is it an assumption of the value of forestry?

3596. No; with the object of determining the best methods of treatment?—I am afraid I cannot say anything of value with regard to that.

3597. I do not care very much to deviate from the line of discussion which we have followed so far; but I should like to mention that on one occasion, at a large party of high officials in Simla, the question of the relation of botany to forestry was under discussion, and a very intelligent gentleman there—he was a high official who was afterwards made Lieutenant-Governor of Bengal—said: "Now, gentlemen, you must not mix up the two things. There is an old saying, 'Make a botanist and spoil a forester.'" It has always appeared to me that because forestry in our Colonies and in India was originally started by botanists—and the thanks of the nation are due to the gentlemen who have done that—the thing has got a little mixed up, and some people have come to consider forestry too much as an appendix to botany. I think we ought to have got beyond that, according to my idea. Starting from botany as one of the principal bases, I think we have developed a branch of science of our own—applied science. The bases of forestry are a series of branches of knowledge, such as mathematics, chemistry, physics, and a certain amount of mechanics. The foundations in the second line upon which I base the science are three—geology, entomology, and botany—of which botany is the most important; and then on the top of that we have built up forestry proper, such as the application of the sciences to sylviculture, forest protection and utilisation, forest management, and all the other works connected with the subject. You would not accept that as a reasonable exposition of the case?—Of course "reasonable" is here an invidious word, but I should dissent from it. I should put it in this way, if I may. We regard the science on which a doctor's education is based as anatomy, the structure of the human body; we regard the fundamental science on which a miner's education is based as geology; and I think we regard the fundamental science on which the education of a man who is going to take care of plants is based as botany, the structure of plants. I think the central science on which an art or craft is based can generally be clearly stated. In this case I think it is clearly botany. There are plenty of other illustrations. We should say the same with regard to almost any special craft. The great training of an engineer turns on the construction of an engine. The fundamental point with him is not the accessory parts of mathematics which he has to use. He has to use a good deal of that; but undoubtedly his fundamental science is physics, mechanics, and their application to the structure of engines.

3598. And mathematics?—Yes, there is a good deal of mathematics required.

3599. But you cannot study physics without mathematics?—True; nor can you study botany in all its aspects without mathematics.

3600. It has been applied very considerably of late to botany?—I think it is the same with many other things. There are many crafts and arts where chemistry is obviously the central science, but I think it is perfectly clear, in my mind, quite apart from prejudice as a teacher of botany, that all one can know about the plant is the fundamental part of the whole subject of technical forestry.

3601. You have given us as an example that the organism of the human body is the foundation of the study of the doctor. Would you think it a doctor's business to study the multiplication of the human race to produce as dense a population as possible on a given area, to grow as many men and women on a certain area so as to have the largest possible production in the way of population that you possibly could have?—True; but unfortunately, when dealing with men, other difficulties come in; but supposing he was a breeder of animals, he would have to do that.

3602. In a certain way; but in the case of forestry it is not so much the individual plant. There comes in the economic aspect, to produce the greatest quantity of timber of a certain description under the most favourable conditions, and that obscures a little the botanical aspect of the question?—It seems to me that that is an extension of the subject, that the forester has to apply botanical problems in particular ways. I have already recognised that.

3603. He may have to set aside altogether many botanical considerations with regard to individual plants?—Undoubtedly.

3604. For instance, he may have to squeeze his tree into a narrow shape, instead of allowing its natural development?—Yes, certainly. I am not saying that he should study every aspect of botany; I am selecting certain aspects of botany. I simply say that botany, as far as botanical training goes, is of fundemental importance.

3605. We all know that a forester must have a considerable knowledge of botany. The only thing I wished to point out was that, according to my opinion, there were other things fully as important as the study of botany?—Just so.

3606. (*Professor Campbell.*) There is one point on which you are quite clear, namely, that you would first of all train a man in the sciences at the University, but he would have to go to a forest for practice?—I do not think there is any doubt about that.

3607. Do you consider forestry as a suitable subject for higher University education?—I draw a distinction between forest science and forestry when it has gone past a certain stage. It is then the application of educational subjects. I think it would be perfectly fair to ask a University to train a forester up to a certain point. Then the technical forester takes him in hand, and I do not think the University could do that, it must depend so much on the ability, the experience, and the opportunities of the technical forester; but it is no longer then an educational subject in the wide sense of University training. It is now an essentially technical subject, by means of which the quickest and most profitable returns must be obtained as best they may.

3608. Of course, the same applies to agriculture, does it not?—I think so.

3609. Agriculture has been made the subject of university education in this and in foreign countries?—Yes. We call it in Cambridge, it will be noticed, the Agricultural Sciences, and I think we draw the distinction (though some would be prepared to go a little further), though we are in the minority, I am afraid.

3610. The student would obtain his technical knowledge in the forest?—I think he must.

3611. You would divorce him from the college or the University altogether during the last two years of his course?—I think it would have to be that.

3612. In submitting this scheme, do you wish it to be taken as evidence of what a course in forestry should be, or simply as the best that could be done at Cambridge?—I thought it might be taken as an outline course of what I should regard as a good course in forestry. I ought perhaps to have said in my statement somewhere: with regard to Part III., I am really dependent on Dr. Schlich. I have practically taken this from the syllabus at Coopers Hill, with which I was fairly familiar, but with regard to the rest, I have thought it out a good deal, and it seems to me to be

a kind of course that should be aimed at. I should like it to be quite clear with regard to Part III.

3613. The first part of the training would be the study of botany, chemistry, mechanics, physics, and geology?—Yes.

3614. You do not include zoology, I see?—I do not include zoology. I felt that something should be done here very much as we do in agriculture. There is subsequently a class in entomology, and perhaps it throws on the entomologist the responsibility of teaching the students elementary zoology. I am quite prepared to admit that in an ideal course a little zoology should come in, but I was trying to deal with it practically.

3615. But I take it that his course in Part I. is the ordinary course given in the University for, say, medical students, or at least for science students?—Yes.

3616. There is no direct reference to forestry here?—There is no direct reference except on the part of the Professor himself.

3617. But you would not expect the Professor to make any direct reference to forestry, seeing that he is teaching a number of students that attend for another subject?—As a matter of fact he does so, although we do not teach forestry. I still pay a good deal of attention to matters of interest in forestry, and also in agriculture, in my elementary lectures.

3618. With regard to chemistry, you would expect that applied chemistry, chemistry as requisite for the forester, would be given in the chemistry class, and similarly with mechanics, physics, and geology; but you regard botany as of such importance that you could not possibly give all the applications in the elementary course?—That would be impossible.

3619. It is for that reason that you set out applied botany under a separate heading, and give an illustration of the subjects that you teach?—That, I think, fairly expresses it.

3620. How many lectures does Part I. involve in each of the subjects?—I cannot say, of course, with regard to any other subject but my own.

3621. Is it a substantial course?—Very. It involves something like 60 lectures, and twice that number of hours of practical work, besides work in the field.

3622. Then in Part II., forest botany, have you any means of knowing how many hours that would require?—That we do not do; that would have to be worked out, and it would mean a good deal if properly done. It might mean at least two lectures a week for two terms, and twice that number of hours in the laboratory.

3623. Then as to Part III., you do not profess to give authoritative evidence?—Not on Part III.

3624. That should be given in the forest school?—Yes, that is the technical work in the forest.

3625. Have you in your mind the training of foresters or land agents or landowners?—Foresters, I think. I quite see that a land agent who only comes incidentally in contact with woods might not need so thorough a training, but that, of course, would be likely to remove it from the curriculum of the University.

3626. The point that occurs to me is that you are not likely to have foresters attending these classes at Cambridge in view of a forester's small remuneration. The stipend of the forester, as you know, is very small and the cost of living at Cambridge is pretty high?—I cannot give you details at once, but they can be obtained for you; I believe that difficulty has been got over to a large extent in the agricultural school. I think you will find on inquiry that they have solved the expense difficulty very fairly.

3627. Have you met a number of practical foresters?—Yes.

3628. Do you intend that the practical foresters, the men that you have met, should take this particular course?—Yes, that is chief foresters. I mean men who attain dignities which Dr. Schlich has gone through many years ago and superseded. I should say that they ought to be quite as thoroughly trained as is here implied.

3629. For example, foresters in charge of the woods of a fairly large estate?—Yes. On some of those large estates that I have seen, such as the Duke of Athol's in Scotland, and so forth. It seems to me that such estates ought to be under the management of men who have a very thorough training indeed.

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3630. Does it not occur to you, as it does to me, that these practical foresters, at any rate, if you turn out a large number of them, would be much better foresters if they received their training in a forest school, where you could have the class rooms attached to the forest?—I think that is possible.

3631. It would be much better to remove forestry out of the University curriculum altogether, except a course for landowners who are there for a liberal education?—Yes. We must not forget that the circumstances would not decide it entirely; so much depends on the men and the teachers. If you can get together a series of teachers, such as some of my colleagues in Cambridge in a school of that sort, that is undoubtedly the ideal arrangement, but it must not be forgotten that it involves a good deal. It has grown up slowly in an old University. It is not made by merely offering small salaries to men you come across.

3632. You do not agree with me, then, that a good teacher of natural science together with a good teacher of practical forestry would be enough at a forestry school for young foresters who expect to obtain salaries of 80*l.* to 100*l.* a year?—If you mean that the teacher of natural science should take up four or five branches, I should deprecate that strongly. I go so far as to say that I think the more elementary the teaching the more thoroughly experienced the teacher should be. It has always appeared to me that it is the duty of the most experienced teacher to take the elementary courses.

3633. Quite so. I agree with you entirely in that; but in view of the demand for skilled foresters, and in view of the necessity of getting them interested in the subject, do you not think that if we are to rely upon these higher centres of instruction it would be a long time before we got our foresters trained; and that a school such as I am foreshadowing might be better at any rate for the rank and file of foresters?—I would put it in this way rather than that. I would have a technical forest school and would send to Oxford or Cambridge or Edinburgh, where men have been trained in this preliminary science, and have just taken their degrees and want something to do, and ask them to come. You would get them if you offered them a year's training in the technical course, if there was an opportunity of their subsequently getting even low salaries—a living wage.

3634. You are quite clear that it would be a mistake to have a small forest school with a few class rooms where young men who are aspiring to the position of head forester could receive instruction in the sciences underlying the practice of forestry as well as in practical forestry itself?—If you rely on teaching in that school all the preliminary subjects and the fundamental subject, I think it would be quite a mistake.

3635. In fact, you would rather see a man receive nothing but a training in practical forestry?—Yes.

3636. (*Mr. Stafford Howard.*) I think in answer to Dr. Schlich you said that assuming this scheme which you suggest in your memorandum was accepted it would take from two to three years for students to go through it?—Yes.

3637. That is having regard to the present length of University terms, assuming that all the instruction would be given within the period of those terms?—Yes.

3638. It is not unusual, is it, for some students who are interested and keen in their work to utilise the long vacation?—That is done regularly.

3639. Assuming there was a State forester available, would it not be possible that a portion of a long vacation might be used by students to take up Part III.?—I think so.

3640. It is not at all necessary that the lectures and instruction in Parts I. and II. should be given by the same person as the instruction in Part III.?—No; that would be a practical illustration of what I mean by dovetailing the courses.

3641. So that students might get the three parts within the three years if they devoted a certain portion of the long vacation to instruction in a State forest, assuming one were available?—Yes, that is so.

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Mr. JOSEPH PARRY, called; and Examined.

3642. (*Chairman.*) You are Chief Engineer to the Liverpool Corporation Waterworks?—Yes.

3643. Can you give the Committee some information as to the extent of the area from which the water supplies are collected in Great Britain for large towns?—The water supplies of towns and villages are derived from three different sources, rivers, wells, and catchment areas, from which the water is collected into reservoirs. With regard to the wells, of course, we have nothing to do here to-day, and in regard to river supplies I propose to say very little, simply to call attention to the fact that a very large part of the water supply of the country is derived from rivers, as in the case of London, where water is pumped direct from the Thames and Lea. In such cases the local authority or the water company have control of the works, but possess no power of any kind whatever over the gathering ground. They differ from the cases to which I propose to call special attention in this respect, that the river supplies are taken from an area difficult to define, and an area over which it has never yet been proposed that any control should be exercised in the interests of the water authority. I can only give you the figures very roughly, but there are probably altogether 14,000 square miles of country in Great Britain drained by rivers above the points of intake from which the water is pumped for the supply of towns. That includes, of course, a very large area (3,542 square miles) from which the companies taking water from the Thames derive their supplies. In passing I may just observe with regard to those river areas that increasing attention has been given of late years to the sanitary condition of these gathering grounds, and it appears to me pretty evident that sooner or later the rivers must either be abandoned as sources of supply, or some means must be taken either by reducing the resident population, or by stringent sanitary measures to purify the sources. However, I pass by the river supplies, and come to the more special case of the reservoir gathering grounds. The catchment reservoirs which are formed for the purpose of collecting waters from upland sources for the supply of towns and villages are, of course, numerous. There are a great many cases of the kind, and I have not been able during the time at my disposal, to get for the Committee complete information with regard to the areas that have been assigned to the different towns of the country, but approximately, I think you may take this—I hope to give more accurate figures hereafter—that the gathering grounds in Great Britain contributing to reservoirs constructed for waterwork purposes amount to something like 900 square miles, or 576,000 acres. Perhaps a few examples of these would interest the Committee. For instance, Birmingham has 45,560 acres; Bradford, 27,970; Liverpool, 32,742; Manchester, 30,220; Derwent Valley (a recent case), 31,600; Newcastle, 6,000; Glasgow, 25,752; Dublin, 14,080 acres. Those are included in the figure which I gave you just now of an approximate total area of 900 square miles. That is to say, an area of about 576,000 acres has to a large extent come under the control of local and other water authorities to collect and impound the streams flowing off that area for waterworks purposes. The next point I have down to call attention to is with regard to the character of those gathering grounds. For the most part, indeed, with very few exceptions, the gathering grounds are in districts very sparsely populated, hilly districts, and districts to a large extent particularly and peculiarly appropriate for growing timber. The statutory provisions for preventing pollution of the water, in which these water supply authorities are naturally very much interested, have hitherto been of a very inadequate character, and the attempts that have been made by bye-laws, by regulations, and by putting into operation the clauses of the Public Health Acts and the Prevention of Pollution Acts, have failed for the most part to protect the water from being polluted in a manner likely to be injurious to health, with the result that for some years now there has been a growing feeling in the country among waterworks engineers and water authorities generally, that it is essential in order that the domestic supply may be preserved from contamination that the water-sheds, the drainage areas contributing to the reservoirs, should be entirely under the control of and therefore owned by the waterworks authorities. I think the first example of powers being given by Parliament to acquire a water-shed for that purpose occurred in 1879 in the case of Thirlmere, for the Manchester supply, where the whole of the drainage area was purchased by the Corporation. Liverpool followed in 1880, in connection with its Vyrnwy supply, and was authorised to acquire by agreement the whole of its new water-shed. More recently the difficulties of acquiring water-sheds by agreement have led a considerable number of towns to apply to Parliament for compulsory powers, and at this moment I am engaged for Liverpool in promoting a Bill which is before a Committee of the House of Commons to acquire a water-shed at Rivington, of 10,000 acres, from which Liverpool has been partly supplied for the last 40 years. I think no recent Session has passed without one or more Bills being before Parliament from important corporations for similar powers. I can refer you to Leeds, Halifax, Bradford, and a number of cases of the same kind, and I hope to be able to send the Committee a complete list of those cases at a later stage. Of course, the question arises naturally, and has been the subject of discussion within the last two or three days in the Committee on the Bill to which I have just referred: What is to be done with these areas when they are acquired? How are they to be utilised? Is it proposed to depopulate them, pull down the residences and farmsteads, or in what other way are these large areas to be dealt with? One conclusion seems gradually coming to be arrived at by all experts in these matters—I mean more particularly the medical experts and bacteriologists—that no use of a water-shed which involves the existence of a considerable number of human beings in farmsteads or residences can be held to be consistent with the maintenance of a high standard of purity in the water supply, and that necessarily and obviously leads to the further conclusion that the farms and other residences must to a large extent be pulled down. Then the question arises, What is to be done with these areas? And it is at this point, I think, that the question becomes one of very considerable interest to this Committee, because I have for some time arrived at the opinion that no more useful appropriation could be made of those water-sheds than to apply them, at all events to a very considerable extent, to the purposes of forestry. It seems to me that those areas are eminently suited for planting, and that it would be a method of utilising the water-sheds which would both contribute to the yield of water, and would effectually prevent any pollution taking place, and at the same time would bring to the local authorities—and this, from their point of view, is an important consideration—some reasonable amount of return upon their capital outlay in the purchase of the lands. I may say that one of the difficulties hitherto experienced in connection with the purchase of water-sheds has been that in proceeding upon commercial principles and on commercial lines, it has been extremely difficult, in fact, almost impossible and hopeless, to acquire by agreement the ownership of the lands, and when they are acquired compulsorily it means that costly arbitrations have to be held, and amounts paid as compensation for which no adequate return in the shape of annual revenue from rents can be obtained. So much by way of general observation. Now I come to the special question of Liverpool, of which I can speak, of course, with greater authority. Perhaps it would assist the Committee if I put before you a plan which shows Lake Vyrnwy, the artificial lake formed by the Corporation under the powers acquired by them in the year 1880. That lake nearly five miles long, with an average width of about half a mile, the maximum being three-quarters of a mile, has a direct drainage area of 18,500 acres. There are two adjoining areas which Liverpool has power to collect and convey into the same lake, but with respect to which the works for diverting the water have not yet been completed, so that for the moment I am dealing only with the 18,500 acres draining directly into the lake. The green colours on the plan show the position of the plantations to which I shall refer more fully. Bearing upon the question of the planting of trees upon that area, out of a total of 18,500 acres there are 1,000 acres between the top water line of the lake, which is 825ft. above Ordnance, and the 1,000ft. contour; 2,000 acres between the 1,000ft. and the 1,250ft. contour; 3,600 acres between the 1,250ft. and the 1,500ft. contour, and 8,000 acres between the 1,500ft. and the 1,750ft. contour, the rest of the drainage area being at a still higher elevation. That will give the Committee an

idea of the extent of the ground available for planting purposes. In the first instance, the Corporation, when they became the owners of this land, authorised certain planting operations, I may say almost entirely for ornamental purposes; that is to say, it was not with any deliberate intention of growing timber for any useful or commercial purpose; it was for ornamental purposes, and also to some extent for estate purposes. But proceeding upon that principle and method, the planting was not very successful. The trees were planted far too widely apart. Those who designed the planting thought that by just planting a clump here and there, and a tree here and there, they could produce a beautiful landscape effect, overlooking altogether the fact that Nature would not allow the trees to grow under those conditions, and I am afraid a good deal of money was spent without any very satisfactory result. That will, I think, bring you to the point at which, in the year 1894, I got a report from experts in Cheshire, a firm of large experience in the cultivation of trees, with regard to the state of the plantations on the Vyrnwy water-shed, and on the subject generally. I acted for some time on the advice given in that report, but not being quite satisfied with the result, I was put into communication in the first instance with Dr. Schlich, and subsequently with Mr. Fisher, of Coopers Hill College. He came down and made a report, which I will put in, to the Corporation, dealing very fully with the entire subject of the plantations, and their condition, and giving very full advice as to the methods of treatment to be adopted in the future. The recommendations have, almost without exception, been carried out, and with considerable success. I shall be prepared to answer any questions the Committee may desire to put with regard to the results obtained, but I first hand in a statement (*Appendix XVII.*) showing the trees that have been planted during the last five years, since the date of Mr. Fisher's report, from which it will be seen that altogether we have in the period named planted 162,260 trees in the Vyrnwy plantations, that is, in the plantations shown on the map. Considerable importance was attached by Mr. Fisher to the establishment of nurseries for the growing of our own seedlings, and under his advice I added to the nurseries then existing. At the present time I have three nurseries, with a total area of 8,200 superficial yards, one containing 1,700 yards, another 3,400 yards, and another 3,000 yards, and in those nurseries at this moment I have a total number of something like 231,000 young trees ready for planting out. Perhaps it may interest the Committee to have a statement in detail of the plants now in the nurseries. (*Not printed.*)

With regard to expenditure, and still confining my remarks to the last five years, we have spent on the nurseries proper a total of 300*l.* only, and the total expenditure on the plantations, I think, has been at the rate of about 200*l.* a year. The staff I have comprises the forester, the man in charge, and a gang of three, four, or five men, according to the necessities of the season. One of the principal difficulties I find in utilising timber from the Vyrnwy plantations is that of cartage. There is no station nearer than ten miles off, and the intervening country is hilly and difficult for traction, with the result that cartage is a very expensive item. I cannot get more than something like about 4d. a cubic foot for fine larch timber on the margin of Lake Vyrnwy, while if I had the timber at the railway station, ten miles off, I could probably get 1s. and 1s. 3d. per cubic foot. At an early date my attention was given to this point, and it seems to me clear that before I can hope to carry out successfully any large timber growing operations around the lake, which I hope to do in the future, I must devise some means of utilising the timber to a greater extent locally; that is to say, I must put the timber into such a state as will reduce the amount of cartage by making it, as far as possible, of commercial value on the spot where it is grown. In that connection the question arises in what way, and to what extent, mechanical power is obtainable for the purpose of developing local industries, and of utilising timber for different objects. In connection with all waterworks undertakings of this character there is first of all an item of what is called compensation water; that is to say, the water undertakers, in consideration of being allowed to impound the streams from the watersheds, come under an obligation to discharge to the rivers which are affected a specified quantity of water day by day throughout the year, which is called compensation water. That compensation water has to be given out of the reservoirs where it is collected. In the case of Lake Vyrnwy, Liverpool has to give a daily compensation throughout the year of 10 million gallons to the river, and periodically, in what are called freshets, during eight months of the year for four days of each month, a volume of 40 million gallons a day, making a total of 50 million gallons per day for 32 days of every year. That water going out of the reservoir or lake from a considerable elevation above the river level at the foot of the dam means that there is a considerable amount of motive power which can be made use of for some purpose or other. In the particular instance of Lake Vyrnwy, we have a daily horse power available from this compensation water alone of from 100 to 150 horse-power, and the additional power available from the special freshets I have described, if it could be utilised, represents something like 400 horse-power. I see no difficulty in this instance, as in other similar cases, of utilising that power, electrically or otherwise, for forestry purposes. That is to say, to begin with one would have a saw mill, where the timber could be cut up into the various sizes required, and what I should desire would be that within a reasonable distance, at the nearest available spot, there should be established village industries, where either bobbin-making or some of the other numerous uses of wood with which I am sure the Committee are more familiar than I am, could be carried on, and I see no reason why, in that way, not only should the watershed be utilised advantageously for the growing of timber, and the timber afterwards converted into a marketable commodity, and at the same time a very great amount of benefit done by giving to the rural populations what they so much need, some occupation in the shape of village industries. I suggest that scheme, in rough outline, as being, in my own mind, a desirable state of things to bring about eventually. This Vyrnwy reservoir is, of course, new, and up to the present time nothing has been done because the plantations are in a very early state of growth, and are not yet sufficiently developed to justify any expenditure in the direction I indicate. Generally speaking, scarcely anything has more impressed itself upon me in connection with this subject of timber growing than the great importance of trying in some way to utilise it locally, as near as possible to the point of growth, because I see that in a great many instances which are within my own personal knowledge the difficulty of utilisation arises from the cost of cartage. I can refer you to plantations now, which have attained to full maturity, where there is very valuable timber, which could be sold with great advantage if it were at a railway station or near to a large town; but owing to its distance from a station, and owing to the difficulty of access, it is almost worthless. The next point on my notes to which I desire to call attention is the difficulty I have myself experienced, and which I know to exist to a large extent, of obtaining the services of skilled foresters. I have had to make several changes in the men in charge since the Vyrnwy works were completed, and I have found the greatest difficulty in getting suitable men to take charge of the planting. It seems to me that there is a very large field for the training of men skilled in timber growing, and that a great deal more might be done than is being done now in the way of qualifying men for such work, especially for the work of an ordinary forester—I mean a working forester—by some system of apprenticeship or otherwise. The want of technical advice, guidance, and knowledge on the part both of local authorities and of landowners, with regard to the proper methods of timber growing, I think points very clearly to the necessity there is in some way or other of diffusing information on the subject, and of placing within the reach of those who have the opportunities of planting timber really good expert advice and guidance. I think that is a very great want, and that the failures which have occurred in so many places, and of which I know some instances, and which are due to the want of proper technical skill and experience, have deterred a great many people from spending what they otherwise would have been disposed to do. I think I have stated broadly the points I wish to bring before the Committee; I shall be very glad to enter more into detail if desired. I have omitted to give you one figure which is perhaps of importance, namely, that the total area of plantations shown on the drawing, and now in the possession of the Corporation, is 470 acres.

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3644. Do you intend to go on planting until the ground which can be profitably occupied by timber is fully stocked?—I do to a considerable extent. I may

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say on that point that no definite decision has been come to on the part of the Corporation, and when I say that I desire to extend the planting to a very much larger extent than at present I am rather giving expression to my own individual opinion than to what I know may be the view of the Corporation when the matter is put before them in the shape of a report or a recommendation.

3645. You have found experts to advise you as to a general plan without any difficulty; your trouble is with the working forester in charge?—No, not quite so. I found considerable difficulty in getting expert evidence in the first instance. The expert evidence upon which Liverpool relied up to the time named by me when I saw Dr. Schlich was expert evidence of the usual kind—the expert evidence of nurserymen and of those to whom people usually apply for guidance in the matter of timber growing.

3646. But there are plenty of men in the country who are competent to give advice if one only discovers where to find them?—That is precisely the difficulty. If anybody could be said to be in the position of being able to get guidance and the best expert advice I was in that position when I applied some five or six years ago to the Office of Woods and Forests, but it was not until I was put on the track, so to speak, of Dr. Schlich, that I got to know of the assistance I could get from his Department. I made an application to him, and subsequently advised the Liverpool Water Committee to allow me to ask Mr. Fisher to come down and spend some days at Lake Vyrnwy, and make a report. Very few corporations and very few landowners would go to the trouble and expense of doing anything of that kind. What I suggest to you is that it is really necessary that people should be educated in this matter, and should be advised to seek competent guidance in carrying out their operations.

3647. (*Mr. Stafford Howard.*) I understood you to say that Liverpool acquired this large area—I forget how many thousand acres—by agreement?—Yes.

3648. You had no compulsory powers?—No.

3649. Did you find much difficulty in coming to an agreement?—No, except in one case we did not, because we were fortunate in being able to deal with large landowners, such men as the Earl of Powis, and others, who readily acceded to our desire to become possessors of the watershed. But I may add that other towns have not been as successful as Liverpool, nor have we been as successful at our Rivington water-shed in Lancashire as we were at Vyrnwy in Montgomeryshire, and consequently other towns as well as Liverpool this session have been obliged to apply to Parliament for compulsory powers, and the disposition of Parliament now is to grant those powers readily to any town seeking them. Further, I may say that after the Maidstone disaster, some few years ago, the Local Government Board issued a circular to all local authorities, in which among other things they strongly advised that the towns should become possessors of their own water-shed areas.

3650. In this Liverpool area had you any case where one man was the lord of the manor and other people had the right of grazing over the land?—Yes, there was a lord of the manor, but we acquired all the manorial rights.

3651. After that you had to deal with the individuals who had the grazing rights?—That was an easy matter.

3652. They did not object to sell?—Perhaps I should explain that the bulk of the planting was below the point at which those grazing rights would come into operation.

3653. Are the grazing rights still in existence over the greater portion?—Yes, over the higher lands.

3654. You have not acquired them all?—We have acquired them, but the tenants, who are our tenants had certain grazing rights which they acquired from the lord of the manor, but which would not interfere now with any extended operations in the way of planting, because we are the owners.

3655. In fact you acquired the whole rights?—Yes.

3656. Both the lord of the manor's rights and the farms round the commons, together with the grazing rights attached to those farms?—Yes.

3657. What sort of price had you to give for this land—an agricultural value?—We gave a fair agricultural value.

3658. You do not think you gave an extravagant price?—Not by any means. We gave a very fair price for the land.

3659. If you had been acquiring it solely for the purpose of planting, would it pay you to plant, quite apart from the water question?—No, I will not say that. I do not think it would pay us quite apart from the water question. First of all, taking into consideration the necessity of preventing the pollution of the water somehow or other, taking into account the difficulties there are in conducting ordinary farming operations without causing pollution of the water and all attendant circumstances, it seems to me there is no way of utilising the land better than by timber growing.

3660. I quite agree. It came in as a secondary consideration, after having obtained the area for the purpose of the water supply?—Necessarily.

3661. Then with regard to the distance from the railway station, have you much mature timber there?—No, not much. The figure I gave you had reference to one old plantation, which is fully matured, and is ready for sale.

3662. You found that you could get practically no price because of the expense of transport?—I asked for quotations from the timber buyers in the district, and the quotation I obtained was the figure I named to the Committee, namely, 4d. a cubic foot, as against 1s. to 1s. 3d. at the railway station.

3663. If you could acquire a large area and grow a considerable quanity of timber, it might be worth while to improve the access. Supposing, eventually, you plant a great deal of this area, and you get a large quantity of matured timber, it might then possibly pay to make a good road?—It might possibly pay, but still I think a good deal more might be done than has been hitherto attempted in this country in the way of locally utilising the timber.

3664. I quite agree with you. You have the water-power?—Yes, and we have a great many natives around who are not fully occupied, and whose tendency is to go away to our big towns, because they find the villages not attractive enough for them, and not capable of affording sufficient scope for their labour. I think it would be of great advantage if the men could be retained in the neighbourhood by giving them some occupation of this character.

3665. Are you aware of any towns which have these big water-sheds which are following in your footsteps in this matter?—I have received enquiries from some towns, and I find that where they have acquired water-sheds the question now presents itself to them, What are they to do, consistently with the maintenance of a high standard of purity of the water. We are, I think, leading the way in the matter. The Birmingham works are not quite completed; they have not got so far as we have.

3666. Have you laid out any regular scheme of successive planting to cover a large area, or is it still rather only tentative?—It is still only rather tentative. I have ideas on that point which I have not yet been able to develop, and which are too immature to put before the Committee.

3667. You want to see how these preliminary plantations get on before you involve the Corporation in a large expenditure for a larger scheme?—Yes. I am glad to say that so far the recommendations we had from Mr. Fisher have proved eminently practical and valuable.

3668. (*Professor Campbell.*) What is the character of the surface of the land?—The geological formation of this particular area is the lower Silurian; what is commonly known as bastard slate.

3669. I mean the immediate surface?—It is a thin, rather poorish soil.

3670. Agriculturally, what is it worth?—Agriculturally it is only useful for sheep grazing for the most part.

3671. There is no tillage?—There is no tillage on that part.

3672. There is none on the area at all?—There is none on the area which we have covered.

3673. What kind of trees are you planting?—The

statement put in will give you full particulars with regard to the character of the trees.

3674. One part of your evidence, where you show how absolutely necessary it is to clear the ground of people, does not seem to me quite to agree with your subsequent desire to keep the people on the area and to create village industries?—I am glad you called attention to the point, because my suggestion is that these village industries are to be below the water-shed, entirely off the water-shed. That is a most important point. I may also add that the utilisation of the water power would necessarily be at a lower point.

3675. Do engineers ever consider it necessary to have instruction in forestry?—No, except those who are thinking of going to India, and go to Coopers Hill.

3676. Would it be desirable if a course of forestry were available for them?—No, I think not. I think it would be very much better that men should be trained specially for forestry. What I would like to see done is something of this kind. I should like to see boys and young men apprenticed to the practical foresters in such places as Vyrnwy, who would spend a considerable part of the year working in the forests and assisting with the forestry. Then for a term or so in each year I would suggest that they should go to the nearest university college, or good technical school for instruction in the science of their calling. For example, near Vyrnwy there are the University Colleges of Bangor and Aberystwyth. I would wish that these young fellows should be able to get at those colleges the fundamental scientific knowledge required. They should be apprenticed to the working forester during two-thirds or three-fourths of the year, and for the rest of the year should attend classes and lectures.

3677. The practical and scientific education should go on together?—Yes. I should make a distinction very much in the way we do in my own profession of civil engineer. Civil engineers who follow the profession as a profession must, of course, receive the highest possible training in mathematics and physics, and all sorts of allied sciences and arts, and in like manner I would train the men who are to follow forestry as a profession; but we have another class of men who are employed as mechanics in our works and in other capacities as artisans, who first serve an apprenticeship in the workshops at a low rate of remuneration. They serve an ordinary apprenticeship, just as a brick-setter or a mason would. It is with regard to such men that I more particularly make this suggestion. I should like to see a lot of the youths of the working class trained as apprentices to practical forestry during part of the year, and facilities given to them to go to the college during, say, one term a year, for the purpose of acquiring technical knowledge that would be useful to them in their occupation.

3678. I think you said you have handed in Mr. Fisher's recommendations as well as the report?—I have handed in the whole report, and if the Committee care—I do not know whether it would be of any use—I should be glad to give the earlier reports from other sources; but I do not know that they would be of much assistance to you.

3679. (*Mr. Stafford Howard.*) Did you remove a considerable number of houses and population from the site you have referred to?—Yes, we removed a whole village, 40 houses, with a church and two or three chapels.

3680. A good deal of the land round the lake which is now being planted was used by them for grazing purposes?—Yes.

3681. And therefore, as you have removed the people who used that land, there is now nobody who wants to use it except yourself?—There is somewhat of a hunger for lowlying land on the part of these sheep farmers, because they can send their sheep on to the hills during the summer weather, but during part of the spring and autumn they have a difficulty about wintering, and therefore they want as much lowlying land as they can get.

3682. That they are deprived of?—Yes.

3683. Having taken away a great many of the farms which originally used some of the lowlying land, you are occupying the whole area, and therefore that question does not arise?—We have not taken all the farms. The inhabitants of the villages were mostly the ordinary class of villager—labourers and shopkeepers. There was not much land attached to their houses. We have taken very few farms. What we have done in that way has been mainly the removal of farms from the valley up to sites above the water line, free from danger to the water.

3684. You have deprived some of the farms of their low grazing lands?—Yes.

3685. And they find there is a difficulty in managing their farms?—Yes, that is so; we have had to reduce the rentals accordingly.

3686. (*Mr. J. H. Lewis.*) I understood you to say that you had not found very much difficulty in arranging with the farmers who were deprived of their grazing rights?—Practically no difficulty.

3687. They were satisfied with a reasonable compensation?—They readily fell in with the suggestion that the allowance to be made in respect of the land that had been taken away from them should be settled by arbitration.

3688. Did you consider in reference to the plantations that have already been grown, and which will be grown, that they will derive any advantage from the shelter which the plantations will give?—I think they will, and they do already. I may say that I have received frequent applications from the farmers to plant trees around their houses and farms for shelter.

3689. They are learning, then, to appreciate the advantages of forestry. You are acquainted, I think, with other parts of North Wales as well as with this particular catchment area?—Yes.

3690. In the course of your travels in North Wales did you observe, interested as you are in this particular subject, any considerable areas of land which could with advantage be afforested?—Yes, very large areas which could be utilised for this purpose with great advantage. In putting the matter before the Committee I have confined my observations entirely to watershed areas, but, generally, I do know as a matter of fact that there are considerable areas where it would be a great advantage to encourage forestry and to plant trees.

3691. Are you also aware that there is a considerable amount of water power in North Wales which could be utilised, if the industries of which you have spoken were created in connection with the forests?—Yes. The great need I find to exist is the need of some expert and sound advice on these subjects; that is to say, people do not know quite where to go, and they just leave matters to take their own course. They do not know where to go for safe advice, and they do nothing.

3692. You mentioned that the people living on the soil were not fully occupied throughout the whole course of the year: do you consider that forestry would help to fill up the workmen's year, and that it would give them more continuous occupation than they now have?—I think it would, especially having regard to the fact that a good deal of the work connected with forestry would be done in the autumn and in the early part of the year, January and February, when very often there is want of employment for men living in rural districts.

3693. It would have a tendency to keep them on the land?—Yes.

3694. I presume your experience is that there is a great emigration from the country into the towns in that part of North Wales with which you are acquainted, as well as in other parts of the country?—It is perfectly lamentable to see the number of dilapidated, dismantled, and discarded cottages on the hillsides about North Wales, and indeed over a considerable part of Lancashire. On this very Rivington watershed, in Lancashire, of which I have spoken there are numbers of abandoned houses which were formerly occupied by the peasantry, and to a large extent by people who carried on private weaving industries. Those industries have now been put an end to, and the weaving is done in large factories, and the people have no longer any home occupation.

3695. I think, so far as the catchment area is concerned, you prefer people's room to their company: at the same time below the catchment area it would be possible to so arrange matters that the village industries could be carried on without any interference with the purity of the water?—That would be an essential condition—anything done in the way of industries or involving human habitation should be done below the watershed.

3696. Vyrnwy is situated, is it not, between Aberystwyth and Bangor?—Yes.

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3697. Therefore if it were possible to arrange for classes, either at the University Colleges at Aberystwyth or at Bangor, Vyrnwy would equally benefit?—Yes, and I think the scholars would benefit by the experience they would acquire at Vyrnwy.

3698 Up to what height have trees been planted at Vyrnwy?—About 1,200 feet.

3699. Is that your limit?—No, I do not say it is; it depends so much upon the depth of soil and a suitable exposure.

3700. Given a suitable exposure and a proper depth of soil, do you think it would be possible to carry the plantations much higher?—There is no limit if you have those conditions.

3701. With regard to the effect of the planting of trees upon the rainfall and water supply as well as upon the standard of purity, do you think that it helps to guide the rainfall and increase the water supply?—On that point there is considerable misconception. I think the only benefit derived in the way of increasing the flow of water is the diminution in the amount of absorption, not that it accelerates the rainfall but that it diminishes the amount of absorption and evaporation.

3702. In speaking of the cost of cartage, which is very high in that part of the country, do you think it possible that the developments and improvements in steam traction in the future may make it possible to reduce the cost of cartage?—It would be very difficult to arrange a system of steam traction with such very steep gradients, but I did hope for considerable assistance from the Light Railways Act, and I am sorry to say that my expectations have been very much disappointed so far.

3703. Are the railway rates high?—I was not referring to the high railway rates so much as to the fact that advantage has not been taken to the extent I thought it would be of the powers of the Light Railways Act.

3704. Do you consider the existing railway rates high if you do get your timber to the railway?—They are, unquestionably.

3705. I presume that you have absolute control of the game, and that therefore that does not trouble you very much—you are not troubled by the depredations of rabbits?—I have been very seriously troubled, and it is a constant source of difficulty and trouble.

3706. Although you have absolute control over the land, you find it difficult to exterminate the game?—Yes, and I find that the plantations rather tend to increase the difficulties, because the rabbits find shelter in the plantations, and they have to be destroyed.

3707. Have you carried out fencing to any great extent?—We have over 27 miles of fencing around the plantations. In recent work I have not only put up good fences, but also have taken care to put up strong wire netting to protect the trees from rabbits for a sufficient length of time to enable them to get strong and sturdy.

3708. Has that been effective?—Yes.

3709. What would be the value of the land you have planted simply as grazing land—I do not mean necessarily the amount that was paid for it, but the actual letting value as grazing land per acre?—From 1s. to 1s. 3d. an acre.

3710. From the experience you have already had of the Vyrnwy catchment area, do you think other towns would do well to follow your example in that respect and to plant the catchment area?—Undoubtedly, and greatly to extend it.

3711. (*Dr. Schlich.*) Do I understand you correctly to say that out of the total area at Vyrnwy some 14,600 acres are available for planting?—It depends upon the elevation to which you carry out the scheme of planting. If you take it up to 1,500 feet I should say there are 7,000 to 10,000 acres available.

3712. You said you had some difficulty about transport; even if you worked up the material locally, still there is a considerable amount of transport to be done. When the area is in full bearing you would have to transport 12,000 tons per annum?—Yes.

3713. Surely it would be worth while to make special arrangements for that transport by having your own local railway, or something of that kind, when the areas have come into full bearing?—We have not yet reached that stage, and it is so remote that I cannot form any estimate. What I had in my mind was that in these days of small things and beginnings what is perfectly feasible is to arrange for local developments and local industries rather than to attempt very big schemes which involve railways and special arrangements for transport. Ideally those schemes may be very desirable, but I think in practice it is better to adhere to smaller schemes and to operations that are more immediately practicable.

3714. That is quite true. We have had evidence with regard to this question of transport brought before us. These were all cases where small quantities were in question. In a case like this you might plant up some 9,000 or 10,000 acres, and ultimately you would have 600,000 or 700,000 cubic feet of timber to cut annually; in that case it would be possible to make special arrangements for the transport?—Undoubtedly. As the areas planted increased all those difficulties would diminish.

3715. (*Colonel Railey.*) With regard to the question of the purity of the water, on one occasion I urged a corporation to plant the catchment area of their water supply, and the answer I received was that they did not feel inclined to do so, first of all because they would lose certain grazing revenue; and, secondly, even supposing they were compensated for that, the fact of planting trees on the catchment area would make the water impure, because it would be contaminated by passing through decayed vegetation. You do not believe that?—That is absolute ignorance.

3716. Is it not the case that the water from a wooded area reaches the reservoirs rather by percolation than by rushing over the surface, and thus becomes filtered in the soil?—In both ways.

3717. A large proportion of it, by being held up by the trees, is prevented from rushing immediately down, and thus gradually finds its way into the soil?—There is no difficulty in a properly managed forest in getting rid of all those objectionable features.

3718. Have you ever proved by analysis that water coming from wooded areas is free from contamination?—I have not thought it necessary to obtain special analyses, but I could do so.

3719. Has not the wood on the catchment area another effect in preventing waste by sudden floods? If there is a heavy shower of rain the water runs down at once and overflows your dam, and perhaps damages your works; but if the area is wooded, is not the flow more even and distributed over a greater length of time?—I have not dealt with sufficiently large areas of plantation to prove that.

3720. Are you aware that very careful experiments have been made on that point, and that it has been proved that the evaporation from a wooded area is very considerably less than from a bare area?—Yes, I have heard repeatedly during the last 30 or 40 years opinions expressed by men who ought to be experts in the matter that wooded areas do contribute very much more largely than areas that are not wooded to the amount of water impounded in the reservoirs from a given rainfall; but I think it is not due to the fact of any attraction on the part of forests, but simply to the diminished amount of absorption and evaporation.

3721. You are aware, as I mentioned before, that very elaborate experiments conducted over a long series of years have been made in Germany to prove these facts?—Yes.

3722. (*Dr. Somerville.*) Do you think there will be less pollution in the sense of muddy water in the case of a reservoir whose catchment area is provided with trees than in the case of a bare hillside?—The serious pollution we have to guard and provide against is from the excremental discharges of human beings. That is almost the only source of danger we have very strictly to guard against, because of the risk of conveying disease.

3723. But the cleaner the water is when it enters the reservoir so much the less expense for mechanical filtration?—Clearly so. On that point I may add that it is now the practice in all well-managed works to filter the water from the watershed, however pure it may be, through sand.

3724. Then you are also troubled no doubt in the case of reservoirs, especially when the water has fallen some distance below the high-water mark, with the wind blowing the water up on the muddy banks and becoming polluted?—I have not had very much trouble of that kind, because I stone or shingle the slopes of

the reservoir down to a point upon which the wave action usually occurs. It does arise occasionally.

3725. Do you contemplate ultimately clearing the whole of the sheep off the catchment area at Vyrnwy?—No.

3726. You do not think that the droppings of the sheep, getting washed as they do into streams and carried into the lake, are of any consequence?—It is a matter of minor importance. I should prefer to have a grouse moor, and naturally an entire absence of animal life.

3727. Do I understand you correctly when you state that you have put out something like 160,000 trees into 400 odd acres of wood during the last five years?—Yes.

3728. If my calculations serve me correctly, that only represents about 400 trees per acre?—I must explain that that is only in a limited number of plantations. If you refer to the statement handed in you will find that the plantations where those trees have been planted are all fully described, and if you look at the map which I put in you will be able to get the corresponding areas of the plantations where the trees have been placed. I should also explain that the bulk of the work during the last five years—not the whole of it—has been the filling up of plantations which were imperfectly and inadequately planted before; that is to say, the trees were too far apart, and afforded no shelter whatever, consequently the trees became inferior and failed.

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3729. (*Chairman.*) One of the things you desire and think necessary is the establishment of some centre of information where people could obtain expert advice on forestry?—I think it very important that there should be some better means of giving information to the country on these subjects.

3730. May I ask what you pay your forester?—30s. a week and a cottage.

3731. You think evaporation would be minimised if the gathering grounds and the lakes were well surrounded by woods?—I do not attach much importance to that; I merely mentioned it incidentally. I do not think it is of sufficient importance to dwell upon.

3732. In Dr. Schlich's first volume of his Manual on Forestry, he shows by statistics which have been collected in Bavaria and Prussia that there is a very considerable saving in the quantity of water evaporated from a forest as compared with a free surface?—I have not myself made any calculations and observations of that kind. I propose to send to the Committee more accurate figures with regard to the number of acres available for planting on watersheds than those I have given. It would be very useful, I think, if the Government would ask for a return through the Local Government Board of all the watershed areas in the country. There is no such return in existence now, and it is exceedingly difficult to collect information from private sources.

Mr. M. F. Roberts, called; and Examined.

Mr. M. F. Roberts.

3733. (*Chairman.*) You are a member of the Institution of Civil Engineers, and are Assistant Engineer-in-Chief to the Post Office?—Yes.

3734. The Committee have to thank you for your most admirable statement (*Appendix XVIII.*), which gives us such full information. We have had evidence that British oak is more durable than foreign oak, and I think your tests support that view?—I have very great difficulty in speaking as to the durability, because the oak cross arms used on telegraph poles get mixed, and it is very difficult, after a number of years, to say whether a particular piece of oak is English or foreign. The tests I have made proved the superiority of English oak as regards its strength when subjected to a torsional strain and splitting strain.

3735. I believe you find it is otherwise with the fir. You find that the coniferous timber which you import from the Baltic is far more durable and grown far cleaner than the home timber?—Yes. That is partly due to the fact that the timber which comes from Norway and Sweden is specially selected for telegraph-poles. There is a good deal of rough Norwegian and Swedish timber imported for other purposes, and it is a little unfortunate that the growers of native timber do not apparently sufficiently understand the business of selecting one class of timber from the other for different purposes.

3736. It may be, of course, that they have none to select quite as good?—I do not think that is always the case, because a certain proportion of the different lots of timber we have had for telegraph-poles has been very good, or fairly good. It has not the strength that Norwegian timber has, but it is very good, and much of it has been useful. The great difficulty is that we cannot get long poles.

3737. The fact that you can get some clean-grown poles, and the knowledge that the Norwegian poles are grown very dense, might lead one to suppose that under similar conditions as good poles might be produced in this country as in Norway?—The conditions are not quite similar. The climate and the soil, I think, are the two features that enter into the matter.

3738. I observe that one explanation of the lack of substance and strength in the Scotch timber that you have had is that it is grown too openly, and puts on the wood too quickly?—That is stated to be the case.

3739. I presume these tests may be taken as thoroughly reliable?—They are absolutely reliable. They have not been made to prove either the one case or the other.

3740. Certainly nothing could appear better on paper. With regard to the creosoting of larch, you say in your statement that in any case larch will not take creosote. I do not know whether that is quite the case. I imagine that creosote can be injected; but even supposing it could be injected, it would be too expensive as compared with the other classes of timbers, would it not?—Not in all cases; because when long larch timber can be obtained in an inland district where it is required, very heavy carriage charges are avoided, and consequently larch, although it would fetch a high price, might be the cheaper. We have used larch to a limited extent where it can be obtained, but we have always failed in efficiently creosoting it. Whereas red fir will easily take 10lbs. of creosote per cubic foot, or 14lbs. or 15lbs. if it were necessary to inject so large a quantity, it is practically impossible in well-grown larch timber to inject more than 3lbs. or 4lbs.

3741. Have you estimated the life of an uncreosoted or partially creosoted larch post, as compared with a fir post properly creosoted?—It is a little difficult, because we have no exact information as to the life of a creosoted pole. Creosoting was introduced in 1868, and we may still have some of those early creosoted poles, but we have not many. Usually a pole does not decay; it has to be removed for a heavier line. Poles that have been removed quite recently, and which were creosoted so long ago as 1870, were in fairly good condition.

3742. Are you substituting iron rods for posts for telegraph wires?—Only in towns, where the local authorities insist on having ornamental iron poles, not in any other case.

3743. (*Dr. Somerville.*) Do you use only Norwegian red pine for telegraph-poles?—We use not only Norwegian, but Swedish and Finnish, if we can get them, and also pitch-pine for the square terminal poles.

3744. You do not use Baltic white wood at all?—No; it will not take creosote.

3745. Do you limit the countries of supply to those that adjoin the Baltic more or less, or would it be competent for a firm to tender for a supply of wood from some North German district?—We have never received in this country any satisfactory timber from North Germany. If anybody offered us North German timber we should certainly consider the offer; but timber merchants in England who deal with foreign timber tell us that suitable timber is not obtainable in North Germany. The Riga timber, which is used for sleepers, is an altogether different class of timber. I know that is not in North Germany, but perhaps you are speaking of that district?

3746. Can you tell us in what respect more particularly it does differ from the Finnish or Norwegian or Swedish timber?—It does not grow so straight, and it has less taper. It is a rather curious thing that Russian timber differs materially from Swedish and Norwegian in that it grows very much more parallel, and although parallel timber is valuable for cutting up into deals and battens, it is not so suitable for telegraph poles.

3747. You like a taper on telegraph-poles?—Yes, we

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require the strength at the butt end. Tapering poles are less expensive to creosote and handle, and more sightly.

3748. I think in some of these tests and trials you made of Scotch fir, it was found the Scotch fir was very much heavier than the foreign fir of equal dimensions. Is that so?—I think that was due to two reasons: First of all, that that timber when first offered to us had not been seasoned to the same extent as the Norwegian timber was when it reaches this country; and, secondly, pieces which our inspector called very ugly sticks were sent. There was no taper; they were unnecessarily large at the top. In fact, the measurement showed that that was the case. The specific gravity of Scotch fir is not greater than the specific gravity of Norwegian fir.

3749. I believe you said there are poles actually in use at the present time which were placed in position before 1870?—We should have a difficulty in finding them; but from time to time a pole is brought under our notice that has been standing since that time. We make inquiries respecting it, and we find it to be in good condition. As I have explained, long before a pole reaches that age the line has as a rule to be increased in size, and a larger pole has to be put up.

3750. Is it a fair question to ask you what becomes of the poles that you take up, whether from being too light or having decayed at the base?—If the pole were decayed at the base we should consider it quite useless, and sell it for firewood, but if it is recovered in good condition we should try to use it on the heavier lines as a strut, that is for strengthening the new pole line.

3751. (*Colonel Bailey.*) You mentioned that home-grown oak was, as a rule, more durable than imported oak, did not you?—No; I am not proving durability, I am proving strength.

3752. The oak is obtained from all sorts of sources, is it not?—Yes; in the tables I give the source of supply.

3753. You apply that generally to all the oak you get, or the majority of the oak that you get?—To the majority, to English timber as a class.

3754. Do you know whether the English oak, as a rule, is quick-grown or slow-grown as compared with the foreign oak?—I should say it took a very much longer time to grow.

3755. You would gauge the quickness of the growth by the width of the rings?—Not only that; but I believe as a rule quickly-grown oak is very much straighter than the oak which suits telegraph arms. Coppice oak is very much quicker grown than harder oaks which answer for telegraph arms.

3756. Were the pieces that you found less strong chiefly clean pieces or rough pieces?—Chiefly clean pieces.

3757. Does the Department find it as easy as formerly to get supplies of timber for telegraph poles?—No, the difficulty is increasing every year with telegraph poles.

3758. It is much more difficult to get the necessary supply of telegraph poles now than it was a certain number of years ago?—The difficulty is so great that I have been sent abroad by the Post Office to endeavour to open up fresh sources of supply.

3759. Have your inspectors reported to you the circumstances that have led to that condition?—We have had the information from the contractors (and I think it is correct) that the longer and more suitable poles have gradually been cut out of the forests, and that people have to go to a greater distance from the coast to get the timber they require.

3760. You do not buy any important part of your supply in this country, do you?—We invite tenders for poles, and we allow any timber merchants to quote for the timber we require.

3761. But, as a matter of fact, you buy a very small proportion of the timber you require in this country?—I think I may say that is so.

3762. Is that because you cannot get it, or because it is not of good quality?—It is for two reasons. First of all, with regard to the foreign timber, the foreign timber merchants have formed a ring, and they will not quote to any English timber merchant who wishes to supply the Government according to the Government specification.

3763. I am referring to home-grown timber, bought from English merchants. A very small proportion of the wood you use is home-grown, is it not?—Practically none of it is home-grown.

3764. What is the reason of that?—We cannot get quotations. People are not prepared to tender. In the summary of evidence which I have prepared I mention one case in which we asked eight firms to tender.

3765. What was the tender for?—To supply a small number of poles, with a view of seeing whether they could supply suitable timber for a larger contract.

3766. Would that mean a contract for a continuous supply every year?—No, we make the contracts from year to year in every case.

3767. In regard to the relative durability of the trees you have mentioned, oak, larch, and Scotch pine, you say they are all creosoted before you use them?—We do not use oak for telegraph poles at all. We use oak for the cross-arms on the telegraph poles.

3768. Do you creosote them?—No, it is not necessary.

3769. Do you do the creosoting yourself?—No, by contract.

3770. Do you know how it is done?—In cylinders under pressure.

3771. You say that the Scotch pine will take in ten pounds of creosote to the cubic foot, and that the larch cannot be made to take in more than three or four pounds. If you cut a pole across, after injecting 10 pounds of creosote to the cubic foot, do you find it has penetrated entirely?—No; if it is a pole about 10 inches in diameter it would penetrate to about 1¼ inches.

3772. As much as that?—Yes, through the sap-wood.

3773. It is all in the sap-wood?—Yes. It is impossible in red fir to get the creosote into the heart-wood.

3774. You cannot get it in very far into the larch?—We have tried experiments with larch poles, subjecting them to a pressure of 150 pounds to the square inch, and the creosote then only penetrated three-eighths of an inch.

3775. Would it go right through the sap-wood?—No, it would not.

3776. You speak in your statement about experiments. You have no regular experiments carried on with a series of marked poles, erected for the purpose of determining their life?—No, it would be a very difficult thing to do, because lines are constantly being altered.

3777. I refer to a line of poles of different kinds put up in some special place where they remain for the purpose of testing their durability. You do not do that?—No.

3778. (*Professor Campbell.*) You referred to the increasing difficulty of obtaining your supplies. Is the cost also increasing?—Very much.

3779. Very rapidly?—Very rapidly.

3780. Perhaps you have put that in your statement?—The Postmaster-General desired me not to give exact prices in my evidence.

3781. But still we may take it that the cost has increased?—Yes, very greatly indeed; and we are unable to get at a reasonable price one-tenth part of the home-grown oak we require.

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APPENDIX No. I.

DIGEST of REPORT and EVIDENCE of the SELECT COMMITTEE of the HOUSE of COMMONS on FORESTRY in 1885-7 (H.C. 287, 1885; 202, 1886; 246, 1887).

Note.—In this digest the evidence relating to Ireland, viz., that of Rev. T. F. Flannery, Mr. Andrew Gilchrist, Viscount Powerscourt, and Mr. James Price, all in 1887, has been omitted.

Unskilful Management of British Woods.

Evidence was given that the management of British woodlands was generally unskilful, and that it could be improved (Report, 1887, p. iii., iv.; Barron, 1887, 11-16, 23, 38-9, 84, 110; Boppe, 1885, p. 47; Britton, 1887, 759-60, 781-7, 809-10, 829; Cleghorn, 1885, 302-26, 406-12; Clutton, 1887, 1918; McClellan, 1887, 400-7; Macgregor, 1887, 675-81, 1054-9; Mackenzie, 1886, 505-20, 523-8; Michael, 1885, 269-71; Pearson, 1885, 506, 510-12, 519; Powell, 1887, 2101, 2178-80; Rogers, 1886, 453; Schlich, 1886, 333-8; Thomson, 1887, 1259-60). This condition is, however, due to a great extent to the fact that the woodlands are not always planted or managed for revenue, but often for game or ornament (Boppe, 1885, p. 47-8; Lascelles, 1887, p. 135). And several witnesses stated that there are some well managed woods and good foresters (Boppe, 1885, p. 47; Cleghorn, 1885, 406-12; Clutton, 1887, 1918; Pearson, 1886, 53-6, 136-48; Wrightson, 1887, 323-7). The forests in Scotland appear to be, on the whole, rather better than in England (McCorquodale, 1887, 1342-7; Schlich, 1886, 333-8). Britton considers that there has been deterioration in management (1887, 821); and Schlich, that the planting in Scotland is excellent, but that there has been subsequent mismanagement (1886, 333-8).

Hedgerow Timber.

Much hedgerow timber is spoilt by nails (Britton, 1887, 822-3).

Crown Woodlands.

Public forests are well managed on the whole (Pearson, 1885, 559-61), but the New Forest is degrading, some 40,000 acres having been abandoned, as legislation does not admit of felling or planting, in order to save 14,000 (Report, 1887, p. iv., v.; Boppe, 1885, p. 49; Lascelles, 1887, 843, p. 137-8; Pearson, 1885 476, 560). These 14,000 acres will yield a regular revenue in time, while the future prospects of the Forest of Dean are also good (Boppe, 1885, p. 50).

Climate.

Deforestation affects the climate injuriously (Report, 1887, p. iv.; Brown, 1886, 184, 240; Dyer, 1885, 601-2, 610-15, 627-8), and also causes springs to dry up (Michael, 1885, 228-32, 242, 272-6; Thomson, 1887, 1229-31). In this connection, evidence was given that the area under forests in Great Britain was smaller than theory indicates as the proper proportion for the best conditions of the rest of the country (Cleghorn, 1885, 327-8, 367-80).

Grazing.

Deciduous forests improve the grazing, as grass replaces heather (Boppe, 1885, p. 47-8; Cleghorn, 1885, 418-21, 425; Macgregor, 1887, 886, 903-5, 1103-4; Pearson, 1886, 141).

Industries.

There would be considerable social and economic advantages from planting waste lands, especially in poorer districts, as the increase of woodlands would give much employment (Report, 1887, p. iv.; Cleghorn, 1885, 381-6, 394-401; Macgregor, 1887, 1,121; Michael, 1885, 235-41, 277).

Planting and Management of Woodlands.

A certain amount of miscellaneous evidence was given as to planting and the way in which forests ought to be managed. Thus, the only sound economic principle in forestry is a "constant annual revenue and a constant improvement in production." Owners should draw up a working plan and stick to it (Boppe, 1885, p. 48). Timber should be cut when most profitable (Schlich, 1886, 329-32, 343-6, 367-9), and this most profitable time is prior to maturity (Pearson, 1885, 522, 556-8). Barron considers that trees should be first grown in nurseries, and planted when 4-5ft. high (1887, 53, 175-7); he prefers planting them wide apart—about 12ft.—to thinning (1887, 185-7, 193, 199-207); and holds that trees should be pruned (1887, 189-98), and the shoots of pines stopped (1887, 28-9, 38-9). There is a tendency to decay when trees are frequently planted in the same soil (Thomson, 1887, 1161-5, 1294-6). Referring more particularly to oaks, Boppe points out that broad-leaved trees take a longer time to establish than conifers; oaks furnish the soil with much less vegetable manure, and with oaks there is also less spontaneous ground vegetation (1885, p. 50). Oaks usually succeed only at the second generation (Boppe, 1885, p. 50). Oaks should be transplanted (Campbell, 1887, 745-9).

Cost of Planting.

The following statements as to cost of planting were made:—An estimate for 20 acres of larch came to £84, viz., fencing, £41; cost of plants, £25; planting, £8; and rent, at 10s. per acre, £10 (McCorquodale, 1887, 1379-81, p. 127). Fencing costs about £2 per acre on large areas (Macgregor, 1887, 1093, 1102). 2,232 Scotch acres on the Duke of Athole's estate were planted in 1825-6 with larch and a little spruce at a cost of £4,147, or 37s. 2d. per Scotch acre, viz., value of ground, 25 years' purchase at 9d. per acre, 18s. 9d.; fencing (6¼ miles), 4s. 9d.; roads (5 miles), 3s. 5d.; plants (4,198,300), 6s. 5d.; planting, 2s. 10d.; contingencies, 1s. (Macgregor, 1887, p. 128). Another 2,932 Scotch acres on the same estate, planted in 1815-1818, came to 50s. per acre, viz., value of ground, 25 years' purchase at 9d. per acre, 18s. 9d.; fencing, 11½ miles, 6s. 2d.; roads, drives, and bridges, 8s.; 6,377,100 plants, 7s. 3d.; planting, 3s. 3d.; miscellaneous and subsequent expenditure, 6s. 7d. (Macgregor, 1887, p. 128). A plantation of 900 acres on the Countess of Seafield's estate was fenced, planted with Scots fir, larch, and some other trees, at a cost, including cartage and labour, of £1,300, or about 30s. per acre (Thomson, 1887, 1154, 1212, 1297-1304)

Suitable Varieties of Trees.

As to the growth of individual species in this country, Boppe points out that Scots fir and larch are very successful at high altitudes (1885, p. 46-7), and recommends beech in Scotland, in many cases substituted for, or mixed with, birch (1885, p. 47). Scots fir does better in Scotland than in England (McCorquodale, 1887, 1400-06). The growth of larch is recommended (Boppe, 1885, p. 46-7; Powell, 1887, 2059-60, 2074-5).

Larch Disease.

The prospects of larch plantations are considerably affected by the larch disease. This tree suffers much from the disease in Britain, but not in the Alps, and suggested remedies are rotation of crop, use of seed from the Alps, or self-reproduction (Pearson, 1886, 66-74, 85-105, 113-25); some larch fails from mistakes in planting (Pearson, 1886, 131-5). Macgregor would not plant larch at present on account of the disease (1887, 944-5, 1000-2, 1068-71), which has increased (1887, 1087-92, 1107-8). Powell thinks that the disease is due to an insect, and is likely to decrease (1887, 2059, 2076-80, 2120-8, 2152-8).

Other trees recommended are Corsican pine (Barron, 1887, 45-50), Austrian pine for shelter (Barron, 1887, 47, 199-201), Douglas pine (Barron, 1887, 45-50, 54-9, 163, 177-82; McCorquodale, 1887, 1367-70, 1374-7, 1393-5; Powell, 1887, 2059-60, 2142-6, 2173-6), *Pinus montana* on peat mosses (Boppe, 1885, p. 47), silver fir (McCorquodale, 1887, 1398-1403). A plantation of eight acres under Douglas pine had just been thinned on Lord Mansfield's estate at Scone, and the thinnings, 620 trees, not then sold, were expected to fetch 4s. to 6s. per 100 feet (McCorquodale, 1887, 1367-70, 1374-7). Hooker, on the contrary, cannot suggest any trees which it would be profitable to grow in this country, because change of climate, particularly more rapid growth, may completely alter the timber and render it of less value, as in Corsican pine, cedar, and Douglas pine (1887, 2220-9). Climate may also encourage disease (Hooker, 1887, 2226-9; Pearson, 1886, 90).

Injury by Game and other Animals.

Animals are shut in the forests instead of out, with the result that all undergrowth is grazed down, there is no regeneration, and when trees are cut down or uprooted by gales the forest disappears entirely (Boppe, 1885, p. 47). Cattle should be kept out, they injure mature trees by rubbing against them (Powell, 1887,

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2136); sheep are the "arch enemy" of forests (Boppe, 1885, p. 45). Game is injurious, and plantations suffer much from it (McCorquodale, 1887, 1371-3); more particularly from rabbits (Elliot, 1887, 505-6, 524-6; Macgregor, 1887, 980-2; Thomson, 1887, 1330-1), capercailzie, hares and grouse (Macgregor, 1887, 980-2), and also squirrels (Thomson, 1887, 1202).

Taxation.

Rates.

The only mention of death duties is that they are "extremely unpleasant" (Bathurst, 1887, 582-5).

Rates are a great discouragement to planting (Clutton, 1887, 1932, 1973-5; Powell, 1887, 2056, 2097-9, 2108-16, 2137-9). In America all land planted is exempted from taxation, and a bounty is offered for planting (Powell, 1887, 2056).

Fall in Value of Timber.

There has been a general fall in the value of timber (Bathurst, 1887, 559-64), and prices have gone down by a third in the past ten or fifteen years (Thomson, 1887, 1201). This fall is mainly due to foreign competition (Britton, 1887, 761-80, 788-809, 812-14; Dundas, 1887, 1415, 1423; McCorquodale, 1887; 1362; Macgregor, 1887, 1060-8). Britton refers more especially to Norwegian timber, and states that fully nine-tenths of the timber used in the mining districts of Staffordshire now comes from Norway (1887, 765). Foreign competition is also one reason why the Forest of Dean does not pay (Campbell, 1887, 658-63, 677-82). The fall in value is also attributed in part to the substitution of metal for wood in many industries (Dundas, 1887, 1415, 1466).

Profits.

As to the present profitableness of woods, it is stated that they do not pay, and there is no market for thinnings (Clutton, 1933-6, 2025-8), and Dundas sells his own wood (thinnings and pit props) for what it will fetch, preferably to using it on his own estate (1887, 1417-18, 1450-2). Clutton states that the Crown woods managed by him have certainly not been a loss (1887, 1966-72), and Macgregor, that his woods have been successful commercially, though less so than formerly (1887, 1077-83). Timber will yield a good return if well managed (McCorquodale, 1887, 1363-6). Woods on the Strathspey estate should yield 10s. per acre per annum (Thomson, 1887, 1213-15). An estimate of the value of 20 acres of larch indicated a total profit after 80 years of £3,200, after allowing for cost of planting and interest, etc. [but no allowance for rates and taxes, and only one year's rental] (McCorquodale, 1887, 1378-88, p. 127).

Foreign Competition.

Circumstances favouring imports are, the advantage possessed by foreign timber owing to cheapness of labour in Europe, and regularity of supply (Schlich, 1886, 320-1, 345-7); while foreign timber is also favoured by railway rates (Britton, 1887, 769-80, 793-800; Powell, 1887, 2057, 2092-6, 2151). Thomson finds no difficulty in getting timber to market (1887, 1200, 1227).

Railway Rates.

Quality of Home and Foreign Timber.

As regards the comparative merits of home and foreign timber, the evidence is somewhat conflicting. Macgregor considers that home-grown timber is as good as foreign (1887, 971-9, 992); and Britton states that the latter is used for different purposes, but is not better than English (1887, 815-20, 825). On the other hand, Schlich states that in some cases foreign timber is of better quality than British (1886, 320-1, 345-7); while Dundas, who owns woodlands and a colliery, always uses foreign timber on his estate in preference to his own, because it is cheaper (1887, 1415), and further states that mine managers prefer foreign timber, which is cleaner and straighter (1887, 1415-19).

Use of Timber.

As to the uses for English timber there is little evidence. Beech, much used for firewood abroad, is difficult to sell in England (Pearson, 1886, 137-8). Bathurst's beech is used chiefly for making bobbins, chair-seats, and walking sticks (1887, 590). Dundas sells his thinnings to small merchants who principally use it for repairs (1887, 1417-18); he also sells wood for pit props (1887, 1450-2). It is pointed out that the small wood, for which there is no demand here is much used abroad for making toys and other small objects (Dyer, 1885, 619-24).

Gales.

Foreign competition is more important, as a factor in low prices, than gales (Macgregor, 1887, 1060-8, 1136-9). Timber which has been blown down, however, does not usually fetch so good a price as properly matured wood (Pearson, 1885, 523-8). Gales occasionally cause great loss by glutting the market (Macgregor, 1887, 1060-8, 1136-9; Schlich, 1886, 306-8, 389, 410-11, 426-30); damage from this cause can, however, be to a great extent prevented by shelter belts (Schlich, 1886, 410-11, 426-30).

Imports.

The imports of timber and wood products are very large (Cleghorn, 1885, 341-5; Michael, 1885, 261-4; Schlich, 1886, 251) and a considerable proportion of these imports could be profitably grown in this country (Barron, 1887, 70-5, 129-47, 155-60; Cleghorn, 1885, 341-5, 358-66; Schlich, 1886, 252-3 265-70, 301-5, 375-81; *see also* under Waste Lands, *infra*). In this connection it may be noted that the home production of timber has been estimated at £3,000,000 per annum (Schlich, 1886, 323).

Future Prospects.

Many witnesses were of opinion that prices in the future would rise, although not immediately (Powell, 1887, 2052), or rapidly (Schlich, 1886, 255-62), on account of the present rapid deforestation abroad and the consequent future diminution in the foreign and colonial supplies (Brown, 1886, 224-6; Cleghorn, 1885, 346-7; Pearson, 1885, 514-16; Powell, 1887, 2051-9, 2070-3, 2129-31, 2140-1, 2147-51; Schlich, 1886, 251-62, 298-300, 319-21, 339-42, 404-6; Thomson, 1887, 1222-4, 1256-8). Only from Germany is there likely to be any increase in exports, owing to the general good management of the forests in that country (Schlich, 1886, 404-6).

Other witnesses, generally recognising the probable diminution of supplies from abroad, and a consequent rise in price, also expressed favourable opinions as to the prospects of growing timber in this country. Forests will play an important part in the immediate future (Boppe, 1885, p. 50); it will pay in the long run to put land under timber (Rogers, 1886, 454-7); considerable areas could also be planted near navigable rivers (Cleghorn, 1885, 359-66, 402, 417, 426-8, 448-51); with judicious management timber will probably pay in future (Clutton 1887, 1973, 1988-9); Scots fir will be profitable in the future (Macgregor, 1887, 1003-6, 1013-15).

State Aid.

Some witnesses stated that there was no reason why forestry should receive State aid any more than agriculture (Bathurst, 1887, 552-4, 569-73; Campbell, 1887, 660, 664-8; Dundas, 1887, 1424-5). State loans would be of no advantage if interest were charged; no repayment ought to be required until the crop was ripe (Campbell, 1887, 665-8). On the other hand, it was pointed out that the increase of timber was a question of national importance, and ought to be aided by the State (Clutton, 1887, 1959-66, 2024). Very few owners can afford to plant because of the long deferment before any return comes in (Clutton, 1887, 1985; Macgregor, 1887, 1126-35, 1140; Rogers, 1886, 454-7), and they prefer the more immediate income which they can derive from agriculture or game (Macgregor, 1887, 1110, 1141-3); only the Government can afford to wait for the profits (Rogers, 1886, 454-7). The State should give a subsidy for growing trees, as foreign competition will diminish (Thomson, 1887, 1222-4), and the Government might also plant waste lands (Macgregor, 1887, 1033-44; Rogers, 1886, 454-7).

Waste Lands

Our climate is very suitable for forests, as evidenced by existing woodlands and the fine size of individual trees (Boppe, 1885, p. 45-6, 48). Large areas of waste lands might profitably be planted (Report, 1887, p. iii.; Macgregor, 1887, 885, 969-70, 1028-44 1121-25; Powell, 1887, 2074-5, 2117-8; Schlich, 1886, 263-5, 375-9; Thomson, 1887, 1215, 1225-6, 1232-4, 1249-55, 1325). Boppe (1885, p. 46) estimates that there are 5,000,000 acres in the Highlands, and Schlich (1886, 265-70) that there are probably 20,000 square miles in the United Kingdom which might be profitably planted. Two witnesses oppose this view, Barron saying that woods should not be planted on inferior soil (1887, 27, 42-4, 127-8, 164-72); while Dundas holds that land of less than 3s. rental per acre is too poor for planting, and if worth more can be better employed in agriculture (1887, 1421-3). Barron states also that large tracts of land could be profitably cultivated which now grow rubbish (1887, 60-62, 72, 95-104, 173-4), but by this he appears to mean that large areas of woodlands now actually mismanaged could be rendered profitable, not that waste lands should be planted. As regards the upper limit of value of waste lands, Thomson considers that land should not be planted if it is worth 7s. 6d. or 10s. per annum, and then only in tracts of 300 acres or more (1887, 1215, 1225-6); Powell if it is worth 5s. to 10s. (1887, 2074-5, 2117-8); Macgregor if it is worth 7s. 6d. (1887, 1007-9); and Schlich, if the land is required for agriculture (1886, 263-5, 375-9). Macgregor stated that the average rental of the 20,000 acres under timber on the Duke of Athole's estate would be 2s. per acre "overhead" (1887, 1105-6).

Forestry v. Grazing or Game.

Many owners prefer the immediate rentals from grazing or game (Macgregor, 1887, 1110, 1141-3), while even waste lands may be more profitable as game preserves (Schlich, 1886, 328, 390-2).

Need of Education.

Proper methods of conservation and education of foresters have been followed by beneficial effects.

Conservancy and training have greatly increased the Indian forest revenue (Michael, 1885, 198-210, 265-7); Pearson, 1885, 468-72; Pedder, 1885, 1-12, 43-5, 65, 145, 188-90); while the forests in Germany have been greatly improved, and the production of wood in that country is increasing (Schlich, 1886, 404-6). The difference between skilled and unskilled management of the comparatively small State woodlands in this country would more than repay the cost of a State school (Report, 1887, p. iii.).

The establishment of a forest school and examinations, or, at any rate, of organised instruction, is recognised by all witnesses, but witnesses differed as to the mode in which this object could be secured (Report, 1887, p. iv., v.).

Existing Education—Great Britain

Nearly all foreign countries have schools of forestry (Report, 1887, p. iv.; Brown, 1886, 239), while Great Britain has only Cooper's Hill for the Indian students (Pearson, 1886, 9, 25-6, 159-74; Pedder, 1885, 17-42, 46-54, 170-6, 191-2; Taylor, 1887, 2414-25), with a school for lower grades at Dehra Dun (Pedder, 1885, 36-40, 46-55, 191-2), although the area under forests in the British Empire is greater than that of any other country (Report, 1887, p. iii.; Boppe, 1885, p. 50-1). The instruction given at present in this country, apart from Cooper's Hill, consists of courses at Cirencester and Downton (Elliott, 1887, 472-95, 518-9; McClellan, 1887, 354-6, 363, 396-9, 408); Wrightson, 1887, 225-38, 264-9, 284-5, 288-91, 345-7). Examinations in forestry are also held by the Surveyors' Institution in London, and the Highland and Agricultural Society at Edinburgh, but the number of candidates is in both cases small (Macgregor, 1887, 907-23, 930-2, 951-9; Rogers, 1885, 642-3, 1886, 442-9).

For working foresters and woodreeves the only instruction is the training they obtain under more experienced foresters in large forests, who frequently take pupils (Bathurst, 1887, 557-8, 565-8, 598-605; Campbell, 1887, 629-35, 656-7, 683-8, 711; McCorquodale, 1887, 1348-52, 1355, 1396-7; Thomson, 1887, 1157-60, 1219-22, 1238-43, 1261-7, 1310, 1319-21).

Foreign Schools.

The following evidence concerning the education provided abroad was given:—

France.

The course at Nancy is two years, but kindred subjects are also taught. Candidates for Indian service take a preparatory course of eight months before going into the school (Pearson, 1886, 16-17, 28-33, 159-71). The cost at Nancy is £120 per annum for French students, and £144 for English; the total expense for English students for the two and a-half years being generally reckoned at £500 (Pearson, 1886, 167-70). This is too expensive for foresters (Pearson, 1885, 482-4).

Spain.

The best model on which to base a school in this country would be the school in Spain (Brown, 1886, 202-3; 1887, 2241-2, 2254-66). The Spanish school of forestry is a Government school for forest engineers, the teachers being selected from the superior forest offices, who manage the State woodlands (Brown, 1887, 2241-52, 2269-70, 2276-8). No education is provided for the workmen in the forests; it was tried once, but without success, and it was found better to entrust their education to the trained students who had left the school (Brown, 1887, 2253).

India. Cooper's Hill.

There are two classes of education for the Indian forest service, viz., higher education at Cooper's Hill, supplemented by a stay at Nancy, for the higher grades, which are mostly filled by Europeans; and elementary forest education at Dehra Dun, chiefly for natives, who fill the lower positions in the Government service (Pedder, 1885, 17-42, 46-64, 170-6, 191-2). Cooper's Hill is an engineering college, but some of the students undergo a special training for the Indian Forest Service. The course is 22 months at Cooper's Hill and four months in English or Continental forests. The students are tested by periodical examinations (Taylor, 1887, p. 139-40). There are two professors of forestry, who give between them about two lectures a day (Taylor, 1887, 2423). The fees at Cooper's Hill just about balance the expenditure (Taylor, 1887, 2450-1); the cost of Dehra Dun is about £4,000 per annum (Pedder, 1885, 53-6).

Character of Instruction Required.

There are, roughly, three classes of persons requiring instruction, divided by Pearson into (1) persons intended for the Indian and Colonial service, (2) land agents and the like, who will earn from £200 to £600 a year, and (3) woodreeves, wood bailiffs, woodmen, and foresters (£80 to £120 a year), (Lascelles, 1887, p. 135; McClellan, 1887, p. 129; Pearson, 1886, 9). This classification is not quite universal, and the committee themselves consider that the principal instruction required is for land agents, foresters, and woodreeves, who might receive instruction with those studying the higher branches for home, Indian, and Colonial service; even for ordinary woodmen, simple and practical instruction would be very useful (Report, 1887, p. iv.). Elliot also includes in Pearson's first-class persons who are intended for positions of responsibility at home, such as Woods and Forests Commissioners (Elliot, 1887, 536).

Higher Education.

As regards the highest class, sufficient education is already provided at Cooper's Hill for the Indian students, but no provision is made for educating others who aspire to similar positions elsewhere. More particularly, evidence was given that applications are frequently received from the Colonies for trained men, and that the Government have always been unable to recommend anyone trained at home. Education is therefore required for such men (Brown, 1886, 181-90, 192, 237-8; Dyer, 1885, 591-2, 597-602, 610-5; Pearson, 1885, 477-9; Schlich, 1886, 279-84, 436-9), while some men might also make a living in this country by acting as technical advisers (Campbell, 1887, 700-1; Pearson, 1885, 573-5).

Education of Land Agents, &c. School of Forestry.

Coming to Pearson's second-class—land agents and the like—there is great diversity of opinion. The majority of the witnesses favour the establishment of a school of forestry, usually a joint school for this and the lower grade, Boppe stating that a forest school is a matter of primary importance (Report, 1887, p. iv., v.; Barron, 1887, 21-8, 66-7, 79-80, 93, 112-26; Boppe, 1885, p. 50-2; Britton, 1887, 830-5; Brown, 1886, 192; 1887, 2241-2, 2254-66; Cleghorn, 1885, 311-18, 329-40, 403-5, 413-6; Clutton, 1887, 1924-31, 1937-44, 1955, 1994-2001, 2008-13; Dyer, 1885, 603-9; Hooker, 1887, 2185-97, 2201-12; Macgregor, 1887, 924-9, 933, 946-50, 962, 965-8, 1022-3, 1116-20; Mackenzie, 1886, 501-4; Michael, 1885, 249-60; Pearson, 1885, 485-90, 509, 529-36, 544-5, 573-4, 579-87; 1886, 9; Pedder, 1885, 174-6, 195-7; Powell, 1887, 2061-8, 2102-7, 2159-64, 2168; Rogers, 1885, 640-6; 1886, 458-9, 469-70, 477-81, 497-8; Schlich, 1886, 271-8, 313-5, 434-5, 440-1; Thomson, 1887, 1156-60, 1168-71, 1216, 1267-76, 1311-17); while others think that sufficient instruction could be given in connection with existing institutions by means of courses in forestry, which should form a larger portion of the curriculum, combined with practical work and demonstrations (Campbell, 1887, 637-8, 706-10, 731-2, 751-5, p. 134; Ducie, 1887, 442-4; Dundas, 1887, 1435-44, 1453-63; Elliot, 1887, 500-4, 509-10, 536; Lascelles, 1887, 857, 860, p. 136; McClellan, 1887, 367, 413-27, p. 130; McCorquodale, 1887, 1356-61; Wrightson, 1887, 239-46, 276-83, 286, 297, 338, 342-4), and object to a separate school (Bathurst, 1887, 547, 571, 609; Dundas, 1887, 1435, 1445-6; Campbell, 1887, 629-35, 656-7, 683-8, 711; McCorquodale, 1887, 1352-6, 1389, 1396; Wrightson, 1887, 239-46, 276-83, 286, 297, 338, 342-4).

Courses in Forestry.

Courses in addition to School.

Some witnesses considered that there should be, in addition to a school of forestry, professors of forest economy at Cooper's Hill and Edinburgh (Boppe, 1885, p. 51), and that forestry should also be taught in connection with agriculture at Cirencester, Downton, and the Scotch universities (Hooker, 1887, 2185-97, 2201-12).

Lower Education. School.

As regards the third class of student, again, there were two well-marked views, some holding that foresters and woodreeves should attend the elementary courses (usually at a school of forestry) of the curriculum for intending land agents, etc., who would carry their education on further (Dyer, 1885, 607-8; Hooker, 1887, 2198-200, 2212, 2215-9, 2230-7; Lascelles, 1887, p. 136; Pearson, 1885, 485-90, 509, 529-36, 544-55, 573-4, 579-87; 1886, 9, 14-5, 18-9, 34-6, 60-1, 127-9). In addition, many of the Scotch witnesses noted in the last paragraph but one as approving a school, have apparently considered such a school as being intended for the lower grades (*e.g.*, Macgregor, Thomson). The other view is that woodreeves are best trained in the forest under more experienced men or land agents (Bathurst, 1887, 600-8; Campbell, 1887, 641, 671, 734-7, p. 134; Clutton, 1887, 1941, 1949-54, 2031-3; Dundas, 1887, 1435; Lascelles, 1887, 857-60, p. 136; Wrightson, 1887, 264-9, 284-5, 288-91, 345-7), with the help of a few simple lectures (Rogers, 1886, 486-93; Schlich, 1886, 294-7, 401-3).

Training under older Men.

School Schemes.

Two main ideas for a school were put before the Committee. (1) Pearson's views are that a forest school is required, to reach as low a class as possible, sufficiently economical for wood reeves, while the higher courses of study might be available for land agents (1885, 485-90, 509, 529-36, 544-55, 573-4, 579-87). A complete forest education is not in general wanted in Great Britain, because the salaries paid to foresters are not high enough to make it worth their while (1885, 497, 536, 553). The best instruction for men of university type is about two years, forestry being taken concurrently with other sciences;

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such men would afterwards go to India or the Colonies (1885, 498-500, 553-4). For the woodreeves there should be shorter courses of instruction, preferably a total of six weeks to three months, spread over different periods of the year (1885, 489-50, 533-36, 544-55 ; 1886, 9, 18-9, 34-6, 60-1, 127-9).

(2) The chief alternative school was proposed by Rogers, and two or three land agents, who think that the school should be on very modest lines at first (Powell, 1887, 2061-8 ; Rogers, 1886, 458-9, 469-70. 477-81, 497-8). Land agents cannot afford to spend two or three years on forestry, and residence would be out of the question (Rogers 1886, 458-9, 469-70, 477-81, 497-8) ; there should be two courses of three weeks each, with an interval between and excursions in spring and autumn (Rogers, 1886, 459-68, 471, 474, 494-6). Rogers's theoretical grounds are thus similar to those of witnesses recommending the provision of adequate courses at existing agricultural colleges, but he objects to the latter form of providing the instruction (1886, 476), and is supported by Clutton, one reason given being that many land agents do not pass through such colleges (Clutton, 1887, 1928). Brown, on the other hand, thinks that the school should provide a much more extensive education than is suggested by Pearson, and gives a detailed curriculum (1886, 208-10, 241).

Period of Education.

Other statements, besides those already noticed, as to the length of the course for foresters and woodreeves are, that three months would not be enough (McClellan, 1887, p. 130), that they should have six months (Mackenzie, 1886, 522-3), that they should attend for one year, three months being insufficient (Brown, 1886, 214-7, 223, 232, 236), and that two years are required (Macgregor, 1887, 1050-1). In these opinions, however, it is not always clear how much of the time named is to be actual attendance at the courses, and how much to be work in the forest.

Assistance to Foresters to attend courses.

It is recognised that foresters are not sufficiently salaried to attend a school (Dundas, 1887, 1435 · McCorquodale, 1887, 1352-6, 1396 ; Pearson, 1885, 482-4), and the anticipations of failure of a school appear to be due to a feeling that it would not pay (Campbell, 1887, 629-35, 656-7, 683-8, 711 ; Dundas, 1887, 1435, 1445-6 ; McCorquodale, 1887, 1352-6, 1389. 1396 ; Thomson, 1887, 1169-71, 1207). Macgregor accordingly proposes that foresters should attend free (1887, 967-8), and Dundas that they should be helped with bursaries (1887, 1435-44, 1453-63).

School : Locality.

More than one centre would be desirable, although one school might be established at first, to secure the best equipment and sufficient students (Report, 1887, p. iv., Powell, 1887, 2159-64). A centre would be required for Scotland (Report, 1887, p. iv. ; Barron, 1887, 21 ; Macgregor, 1887, 924-8 ; Pearson, 1886. 48-52, 81-4, 130, 151, 156). Three witnesses considered that a single school would be sufficient (Brown, 1886, 199-201, 245 ; 1887, 2241-2, 2254-66 ; Campbell, 1887. 669-70 ; Schlich, 1886, 370-2, 383-8, 412-3). Several witnesses considered Cooper's Hill the most suitable locality, chiefly because, there being already a chair of forestry, it would be cheaper, and it is close to a forest (Report, 1887, p. vi. ; Pearson, 1886, 9, 36, 59, 106-12, 152-8 ; Rogers, 1886, 460-2 ; Schlich, 1886, 271-8, 313-5, 434-5, 440-1). Dyer thought that it should be near the metropolis (1885, 603-9), Powell in London, ultimately with a branch at Edinburgh (1887, 2061-8, 2102-7, 2159-64, 2168), Brown at Edinburgh (1886, 199-201, 245 ; 1887, 2241-2, 2254-66), while Schlich qualified his preference for Cooper's Hill by the opinion that, if an entirely new school were to be started, it should be near Perth (1886, 370-2, 383-8, 412-3).

School : National versus Private.

The school should be a State school (Boppe, 1885, p. 51 ; Brown, 1886, 204-7 ; Clutton, 1887, 1928 ; McCorquodale, 1887, 1390-2 ; Rogers, 1886, 476) ; and the Indian students should form a nucleus (Report, 1887, p. iv. ; Dyer, 1885, 603-9 ; Hooker, 1887, 2185-97, 2201-12). Pearson considered that it should be attached to King's or University College, London, but not to Oxford or Cambridge (1885, 488, 501) ; Brown to the Council on Education (Museum of Science and Art), at Edinburgh, though the Watt College would be cheaper (1886, 204-7, 227-30, 243 ; 1887, 2257-8, 2265-6). Clutton considered that it should not be attached to any existing body (1887, 1928-31, 1996-7) ; while McClellan objected to its being attached to Cooper's Hill, or King's or University College (1887, p. 131-3), and Rogers to Cirencester or Downton (1886, 476).

Education of Landowners.

Lascelles emphasised the necessity of owners of land receiving instruction in forestry, and suggested that courses might be given at the higher public schools near forests, such as Eton and Marlborough (Lascelles, 1887, p. 135-6).

Development of existing Institutions.

As regards the practicability of developing existing institutions, evidence was given that Cirencester and Downton could greatly extend the education provided in forestry, so as to meet the needs of higher students, but the provision of education for woodreeves would be a much more difficult matter (Campbell, 1887, 643-6, 650, 738-41 ; Ducie, 1887, 449-51 ; Elliot, 1887, 496-500, 516-20 ; McClellan, 1887, 363-4, 370-5, 383-99, 408-25, 431-3 ; Wrightson, 1887, 246, 254-5, 271-5, 294-304, 318-22, 329-42). At Cooper's Hill, however, probably only the regular course, as provided for the Indian students, could be taken, and even the elementary lectures of this would be above the heads of woodreeves (Taylor, 1887, 2425-50, 2454-5, 2466-7, 2471-8).

Lower Education—Miscellaneous Suggestions.

The following statements on various points concerning the education of foresters and woodreeves was also made. McClellan (1887, p. 132), and Campbell (1887. p. 134), opposed concurrent education of woodreeves and land agents. Hooker (1887, 2233-7), held that the training of woodreeves on the estate was not sufficient. Wrightson considered that the education of handicraftsmen was not so important as that of the higher class, who administer the estate (1887, 345). Woodreeves, if they had education, could rise to higher positions (Hooker, 1887, 2198-200, 2212, 2235-6 ; Thomson, 1887, 1204-7, 1219-22, 1267-66), and the labourers performing the labour at the school would learn much (Pearson, 1885, 583-7). Some witnesses thought that the elements of forestry should be taught at the Board Schools (Campbell, 1887, 641, 671, 734-7, p. 134 ; Macgregor, 1887, 1024-7 ; Mackenzie, 1886, 501-4 ; Powell 1887, 2069, 2165-7).

Cost of School or Courses.

As regards the cost of a school, Pearson at first put this at £600 per annum for salaries, viz., two lecturers at £250, and a museum curator at £100 (1885, 495-6). In a revised estimate the following year he puts the annual amount at £1,350, of which £1,150 would be salaries. The expenses of buildings, he considers, need not be great, as the pupils would mostly live outside and pay their own travelling expenses. Against the expenditure there would be set the fees, which he estimates at £1,000, from 50 pupils at £20 a head (1886, 9, 22-4, 42, 57). Rogers, for his more modest school, gives a somewhat similar estimate, viz., £1,200 for lectures and secretarial work, against which would be set the fees at £20 per head, and probable grants in aid from societies (1886, 473-5, 485, 491). Thomson considers the necessary staff to be a professor at £400 to £500, and a practical teacher of forestry at £200 (1887, 1187-90). Dundas thinks the school could not be managed on £600 to £700 a year (1887, 1445-6). McClellan estimates that Cirencester could be developed so as to give complete instruction in forestry at an expense of about £600 a year, while a national school of forestry would probably cost £100,000, with a large annual outlay (1887, 370-1, 423).

Expenses of Students.

Pearson considers that, for his scheme of instruction the cost to foresters would be 10s. or 12s. a week for board and lodging at some country inn, together with fees (£5 to £10) and journeys (1886, 47-8). Landowners might send their foresters to such a place (1886, 35). If courses were provided at Edinburgh and Aberdeen, Dundas thinks that bursaries of £20 to £25 a year would enable a forester who knew his practical work to get additional training at those universities (1887, 1435).

Fees at existing Colleges.

The fees at Cirencester are £135 for in-students, and £75 for out-students (McClellan, 1887, 390), and at Downton about the same (Wrightson, 1887, 313, 338). Residents at Cooper's Hill pay £180 per annum ; to non-residents the fees would be about £30 per annum (Taylor, 1887, 2414-25).

Demonstration Forest.

Practically all the witnesses concur that some amount of instruction should be given in a forest. The absolute necessity of a demonstration forest, part leaf and part conifer, is emphasised (Boppe, 1885, p. 51 ; McClellan, 1887, p. 130 ; Pearson, 1885, 491-4, 549-51 ; 1886, 9, 20-1, 43-6, 75-8, 175-7 ; Schlich, 1886, 289-93, 316-7, 357-9, 417-25), and others also support the projected demonstration forest (McCorquodale, 1887, 1390-2 ; Macgregor, 1837, 927, 966 ; Rogers, 1886, 461-3, 482-3 ; Thomson, 1887, 1180-6, 1277-80, 1315-17).

There is more difference of opinion as to who should control the forest utilised by the students. Some witnesses hold that it should be a State forest (Boppe, 1885, p. 51; McCorquodale, 1887, 1390-2; Pearson, 1885, 537-42; Thomson, 1887, 1277-80), for the reason that change of ownership might cause changes in management (Thomson, 1887, 1277-80), and also because there being no suitable forest in existence the proposed area must be incomplete at first, and can only be perfected in time (Boppe, 1885, p. 51). On the other hand, some witnesses merely state that the students should have access to a forest (Mackenzie, 1886, 520-1), which need not necessarily be connected with the school (Clutton, 1887, 1944-6), or which ought not to be under the control of the Professor of Forestry (McClellan, 1887, p. 131). Brown considers that a demonstration forest is not required at all, but that the pupils should make excursions to forests, and do the practical work by arrangement with foresters (1886, 194-8, 216-7, 233, 242, 244; 1887, 2267-72).

A forest should also be purchased in Scotland (Boppe, 1885, p. 51).

Besides a demonstration forest, it would be desirable to have a nursery near the school (Elliot, 1887, 538-9, McClellan, 1887, p. 133); but a plantation is always incomplete as a field of study (Boppe, 1885, p. 51).

As regards the locality of a demonstration forest, Boppe considers that there is no forest suitable (1885, p. 51), because there are no mature forests in Great Britain (Boppe, 1885, p. 51; Pearson, 1885, 503, 520), although Pearson holds that bad forests are required as well as good for demonstration (1885, 562). Regarding the three large State or Crown forests, the following opinions are given as to their suitability:—

New Forest. The New Forest is not suitable (Boppe, 1885, p. 48; Lascelles, 1887, 844, 850, 855, p. 137-8); it is suitable to some extent, but there are not enough conifers (Pearson, 1885, 540-2, 562, 588-9); it is better than the Forest of Dean (Schlich, 1886, 420-5).

Forest of Dean. Practical teaching could be given in the Forest of Dean (Campbell, 1887, 651-5, 683-91, 711-6), but pupil-labourers could not be taken on to do all the work in the forest, because they would displace local labour (Campbell, 1887, 686-8, 714-6). The Forest of Dean is too uniform (Schlich, 1886, 420-5); it is suitable to some extent, but there are not enough conifers (Pearson, 1885, 540-2, 562, 588-9).

Windsor Forest. At Windsor there is much to instruct, and the Park there is a field for the study of forest botany (Boppe, 1885, p. 49). It is unsuitable, because not sufficiently varied (Pearson, 1885, 588). The forest should be in Crown lands outside Windsor Park, for economy, because there is already a professor at Cooper's Hill (Pearson, 1886, 9, 36, 59, 106-12, 152-8).

Woods at Cirencester and Downton. As regards Cirencester and Downton, Bathurst would give every facility to Cirencester students, but would allow no interference in the management (1887, 542-6, 548, 576, 608). Pearson considers Cirencester is not a good centre, because there are no conifers (1886, 62-5, 112, 149-50); but it is pointed out that there is a very good wood of conifers at Tetbury, in addition to Bathurst's beech woods, while the Forest of Dean is within easy reach (McClellan, 1887, 364-5, 376-8, 393-5, 434-5, p. 132). There is a forest "belt" at Downton (Wrightson, 1887, 225-6).

The oak forest at Scone and the Forest of Dean give opportunity for the study of this species (Boppe, 1885, p. 46, 50). Appendix I.

Excursions. Students should also make excursions to other forests (Pearson, 1886, 58, 83-4, 156-8, 177). Boppe recommends that selected students from Cooper's Hill should be sent for one year to a continental school, and afterwards make a tour of inspection in some mountain forests in France, Germany, and Austria (1885, p. 51-2), while Dyer thinks that students would always be obliged to go abroad for a few weeks (1885, 616-8). McClellan considers visits to forests abroad unnecessary (1887, p. 130).

Research work. Part of the demonstration forest would be devoted to experiments (Boppe, 1885, p. 51; Pearson, 1885, 537-42; 1887, 37-41; Schlich, 1886, 357-8). Research work would be done at the school (Schlich, 1886, 415-6). Experiment stations for research work are very desirable (Brown, 1886, 211-13). A museum should be attached to the school (Pearson, 1885, 488).

Examinations. The Committee recommend that provision should be made for examinations by the Board of Forestry (Report, 1887, p. v., vi; Wrightson, 1887, 276-8, 316, 342-4). These examinations should include practical forestry, botany, vegetable physiology, entomology, geology, and subjects connected with land agency (Report, 1887, p. vi.). Agricultural colleges and the Surveyors' Institution might be offered inducements to send students for examination, by exempting from certain preliminary subjects in which they could show proficiency (Report, 1887, p. vi.). A suggestion was also made that the Board might grant certificates to young colonial foresters for theoretical work (Draft Report, 1887, p. xi., par. 17). Witnesses' opinions are to the effect that examinations, open to anyone, and preferably independent of the school, should be held (Clutton, 1887, 1976-9, 2001-3, 2014-7), and that the Highland and Agricultural Society's examinations might be extended (Thomson, 1887, 1172-9, 1281-7). Examinations alone are, however, not sufficient for educational purposes (Clutton, 1887, 2001; Hooker, 1887, 2213-4).

As regards existing examinations, see under Existing Instruction, p. 143.

Board of Forestry. There should be a Board of Forestry, representative of all the interests concerned (Report, 1887, p. v.; Campbell, 1887, 639-40, p. 134; Clutton, 1887, 1924-31, 1937-44, 1955, 1994-2001, 2008-13; Pearson, 1886, 9). The Board should be presided over by a Government official, an expert for choice, and comprise the principal agencies interested in a sounder knowledge of forestry, especially teaching and examining bodies, as well as the professional societies, three members of each House, and a certain number of owners or managers, preference being given to those in a position to afford facilities for study in their woods (Report, 1887, p. v.; Pearson, 1886, 9). The Board should organise forest schools, or at least regular instruction, examinations, prepare a syllabus and text book (Report, 1887, p. v.). The expense for clerical work and examinations is put at £500, less fees (Report, 1887, p. v.). On the other hand, a Board, as consultees only, from whom owners would be pleased to accept advice, would be desirable (Bathurst, 1887, 615-19; McClellan, 1887, 382, p. 131); and Wrightson advocates a Board for examination only (1887, 276-8, 316, 342-4).

Appendix II.

APPENDIX No. II.

Digest of Certain Publications bearing upon the Objects of the Inquiry.

(i.) Forestry in France. By Lieut.-Colonel F. Bailey, R.E.

[*Transactions of the Royal Scottish Arboricultural Society, Vol. XI., Part ii.*, 1886.]

The *Higher School* at Nancy, where candidates for the superior staff receive their training, has an establishment of thirteen professors and assistant professors. The course, which extends over two years, comprises thirteen months of theoretical and five months of practical work, and two months of examinations. The amount spent by the State on each student during his course of training amounts to about £350. An area of 7,500 acres of forest, situated near Nancy, is placed under the control of the director of the school, for use as a field of practical instruction, as well as for various experiments and researches, to carry out which an assistant inspector is attached to the school staff. The school is well equipped with a very complete museum, a library, a chemical laboratory, and a large collection of models.

The *Secondary School* at Barres is maintained in order to facilitate the entrance of subordinates into the superior staff by the education of such of them as may be deemed otherwise fitted for advancement. The course extends over two years. The teaching is conducted by three professors, who are officers of the superior staff: but additional teachers who are not forest officers can be employed when their services are required. The school is established on a property purchased by the State from an owner who had raised on it a large number of exotic trees of many kinds. There is also on the estate a small forest, which, with a neighbouring State forest, is used for the practical instruction of the students. The buildings comprise residential quarters, classrooms, and a museum. The students, who are lodged at the school, receive from the State an allowance of £2 per month to provide themselves with food and clothing.

The *Primary School* is a branch of the establishment at Barres, the instruction being given by the director and professors of the Secondary School. It is reserved solely for the education of the sons of forest officers and subordinates, who may desire to enter the Government service as forest guards, with a view, in most cases, of ultimately gaining the ranks of the superior staff through the Secondary School.

Candidates must be between 24 and 27 years of age. They are obliged to pass an entrance examination in dictation, French composition, arithmetic, elementary geometry, and French history and geography. While at the school they are styled "student guards"; quarters are provided for them, and they receive from Government a part of their uniform, and an allowance of £1 16*s.* a month, to provide themselves with food and clothes.

The course occupies eleven months, and embraces the following subjects, viz., arithmetic, plane geometry, algebraical signs, surveying, and levelling, the French language, French history and geography, the elements of sylviculture, the elements of forest botany (including vegetable anatomy, physiology, and the classification of the principal forest trees), and the elements of forest law and administration. The instruction is given partly in the class rooms, and partly in the form of practical work done in the forests.

The average annual net surplus of receipts over expenditure from the French State forests, taken over a period of three years, was about 7*s.* per acre.

(ii.) Forestry in Hungary. By Lieut.-Colonel F. Bailey, R.E.

[*Transactions of the Royal Scottish Arboricultural Society, Vol. XII., Part i.* 1888.]

The *Academy* at *Selmeczbanya*, which is maintained for the training of candidates for the superior (State) staff, with a smaller number of mining engineers, is conducted by a staff of six professors. The ordinary course extends over three years. Fees are not charged, and twenty scholarships of £24 each are given to those among the poorer students who are found to have done the best. There is a magnificent library and a very complete museum containing specimens and models. Some forests near the school are placed under the control of the director for purposes of instruction.

Secondary Schools.—Two such schools are supported by the National Forests Fund*; a third was, in 1886, about to be established. The course of instruction extends over two years. The students are maintained either by the State or from the National Fund, or by private persons who may send them to the school. Each school has a staff of three professors, one of whom acts as director.

(iii.) President's Address, Royal Scottish Arboricultural Society. By Lieut.-Colonel F. Bailey, R.E.

[*Transactions of the Royal Scottish Arboricultural Society, Vol. XVI., Part i.*, 1899.]

It is a common saying here that woods will not pay. It is stated that our soil and climate are unfavourable to sylviculture; but no one has explained what is wrong with either the one or the other, and the magnificent isolated trees that adorn our parks and policies disprove the statement. It is said that we lack sunshine; but we are probably not worse off in this respect than the countries surrounding the Baltic, from which we import so largely.

Woods, and especially coniferous woods, develop vigorously on very poor soil; and with the exception of our higher uplands, our comparatively mild and humid climate appears eminently suited for the growing of woods.

Sporting and æsthetic considerations interfere with the practice of correct sylviculture; and this is not surprising, seeing that in the sale of landed estates in Scotland, standing woods are often reckoned as of no value.

We ask for a small State forest, to serve as a model

*This fund is mainly supported by the payment into it of a proportion of the fines levied from persons convicted of forest offences and of sums paid under the law for the compounding of offences. Its revenues are also devoted to the raising of plants, the publication of professional works, etc.; they are supplemented by grants from the general forest budget of the State.

and as a field of practical instruction for students of forestry. There is perhaps no science for the effective teaching of which practical demonstration is more essential. It is impossible to convey a correct idea of many of the most important sylvicultural processes by the use of words and diagrams; and for instructional purposes it is absolutely necessary to have convenient access to woods which have been correctly managed for a long time.

Experts are agreed that we are within a measureable distance of a wood-famine, or at least, of a scarcity, which must cause a rise in prices; and it will be to the interest of owners if their estates can be put into a position to profit by such a rise. This will also be to the interest of wood-managers, who may reasonably expect that the efficient management of a more profitable business would lead to an improvement in their position and prospects.

But to secure this end, a large proportion of our woods must be managed on business principles, under a working plan or management scheme, which may serve to avoid, to a great extent, the evils inherent in changes of owners and managers. The proprietor of the day is entitled to take the annual growth or increase of his woods; but without such a scheme he has no means of knowing whether he takes more or less than he is entitled to. Again, under a regular plan of management the markets are regularly supplied, to the great advantage of both the owner and the timber trade.

(iv.) Establishment of State Model Forests for Scotland. *

[*Trans. Roy. Scot. Arb. Soc., Vol. XV., Part iii.*, 1898.]

Both M. Boppe and Professor Schwappach criticised adversely the condition of our woods, and Dr. Schlich says that our home-grown timber is, generally speaking, inferior in quality to that imported from abroad. He remarks that it comes into the market at irregular intervals and in fluctuating quantities, and that a more complete knowledge of systematic forestry is required by those engaged in the formation and management of woods to be worked on economic or commercial principles. Many reasons may be given why we have exposed ourselves to adverse criticism. In regard to the sylvicultural methods followed in France, Germany, and other European countries, although doubts are expressed as to their suitability to our conditions of soil and climate, a strong desire is very generally evinced that practical proof should now be given of the extent to which methods of treatment, which are successfully employed in other countries, can be applied to our own forests.

We produce a limited quantity of timber of first-class dimensions and quality, but most of our home-grown wood is certainly inferior in quality to that which we obtain from abroad; and this is so far recognised that the former is but little used for purposes of construction by either Government or by private persons. The Postmaster-General, having been requested to try home-grown Scots fir for use as telegraph posts, replied that this wood is less strong than the Norway red fir commonly used by his department, and that it is less straight, and less free from large and rough knots. He added that the difficulty and delay experienced in obtaining even small parcels of Scots fir suitable for telegraph posts rendered it necessary to resort to the Norwegian market in order to obtain adequate supplies. Miners pay high rates for foreign pit-wood.

But, while our consumption of forest produce is steadily increasing, Dr. Schlich has shown that the permanence of our supply of timber from abroad is very far from being assured, and that thus we may before long find ourselves face to face with a scarcity which must lead to an enhancement of the price of timber. Large areas of unoccupied land are available for planting, and we may feel confident that the introduction of remunerative sylvicultural methods will lead to the area under forest crops being largely added to, and to our becoming less dependent than we are at present on supplies from abroad.

State Model Forest Required.

Owners of waste lands suitable for profitable afforestation might be ready to plant, if a practical object-lesson could be presented to them, demonstrating the methods by which a fair return on their outlay could be assured. We want a model forest, first of all in order that we may be able to prove that economic forestry, as taught and practised in Germany, France, and other countries, would yield equally good results under our own conditions of soil and climate. Dr. Schlich and M. Boppe agree in the opinion that, under improved sylvicultural treatment and under systematic working, we can produce timber just as good as that which is grown abroad.

A model forest is also required for conducting experiments and researches, and as a field of practical instruction for students. In regard to the latter requirement, Dr. Schlich insists on the necessity for adequate field instruction, given in forests managed on the right lines, where students can see the theory of economic forestry practically illustrated. M. Boppe urges that every forest school should have attached to it a forest which has, for some time past, been under scientific management; without it, he says, the best theoretical teaching in the world would be of no avail. During his tour in Great Britain, however, he did not find a single forest suitable for the teaching of sylviculture; and it is evident that even the best managed private forest estates lack that continuity of aim and action which alone could fit them for educational uses.

Forest Schools.

State forest schools are maintained in France and Germany, with forests in the neighbourhood which are under the control of the Director of the school. To the Coopers Hill College a portion of the Windsor Forest is attached, but on account of the absence of suitable forests in this country, the students receive the principal part of their practical training in the State forests of Germany and France. Forests used as training grounds for students must be placed under the control of the Director of the school, in order that they may be made to serve their educational purpose in the fullest possible manner.

Considering that we are without extensive State forests, the number of students who, at the present time, might be expected to enter an independent and fully equipped forest school would probably not suffice to provide funds for its maintenance; and the only plan now feasible seems to be to teach forestry in some University or college, where instruction in the auxiliary subjects, such as botany, chemistry, geology and mineralogy, entomology and engineering, is already obtainable. It is true that such an arrangement has drawbacks. Under it the practical training ground must be at some distance from the classrooms, and the auxiliary subjects are taught without that special reference to the requirements of forestry which is so desirable, and which cannot be secured otherwise than at a special school.

In Edinburgh three courses of lectures are given:—

1st.—That delivered daily, during the winter session, at the University, to a small number of students who are following other courses, and who, for the most part, wish to qualify as estate managers; but there have been also a few sons of landed proprietors, a few men seeking a career in the Colonies, and others whose aim was to become farmers, and who elected forestry as one of the alternative subjects prescribed for the degree of Science in Agriculture. In addition to classroom lectures, these students are given such practical instruction as is found possible in neighbouring woods, nurseries, saw mills, timber yards, creosoting works, &c.

2nd.—Weekly evening lectures at the Royal Botanic Garden to a class which last winter (1897-98) numbered 16 foresters and 15 gardeners. It extends over three years, during which time about 40 lectures in forestry are given.

3rd.—Weekly evening lectures at the Heriot-Watt College, where, during the winter of 1897-98, about 30 students assembled. They were for the most part clerks and law apprentices, foresters, gardeners, nurserymen and seedsmen. They were employed in the city and neighbourhood, and could not attend day classes, nor follow courses of study elsewhere.

The course at the University is fuller than the other two, but its value would be greatly enhanced if a model forest were available for practical instruction. A few only of the ex-students have sought to follow the career of wood manager; but it may reasonably be hoped that

* Adopted by the Royal Scottish Arboricultural Society, on 25th May 1898 as embodying their views on the subject.

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as proprietors come to realise the advantages of bringing their woods under a regular system of management, the prospects of wood managers will improve, and that young men who desire to follow this career will then attend the class.

In existing circumstances, the present classes meet a want; and it can hardly be doubted that the lectures given in Edinburgh have had a share in removing the prejudice with which, until recently, sylvicultural innovations were generally regarded in Scotland.

Location of the Model Forest.

Edinburgh is the only place in Scotland where lectures on forestry are now given. It is better to concentrate our efforts in one place, and leave nothing undone to improve the teaching there, than to dissipate our strength in attempts to sustain the machinery of instruction in several places. Dr. Schlich entirely supports this view. He advocates: "One centre of instruction, consisting of (1) theoretical instruction in connection with a University or Agricultural College, where instruction in the auxiliary sciences is already provided; (2) woodlands where practical instruction can be imparted, because in forestry theory and practice must go hand in hand. As regards the first point, theoretical instruction, a beginning has been made in this very city (Edinburgh). . . . The arrangement needs only further development, and to be put on a proper footing, so as to bring the subject of forestry, as regards its importance, on a par with other branches of learning."

The estate to be acquired for purposes of practical instruction should possess a considerable proportion of growing woods, of as many species as possible. For these woods it would be necessary to frame a working plan, which would lay down the general lines of management; and to appoint a manager, who should be a man of the highest professional attainments. A Board of Visitors should be appointed, who would report to the Board of Agriculture.

Estimates and Provision of Funds.

It has been estimated that the cost of from 1,500 to 2,000 acres of land within easy reach of Edinburgh, and including some 500 acres of growing woods averaging 40 years of age, would not exceed £40,000; that the net annual income from such an estate would not be less than £1,000, and might be as much as £1,500; and that this income, with an annual grant of £500 from Government, would meet all charges for maintenance. The property would be vested in the State.

It seems reasonable to ask the Government to take the first step towards a much-needed reform in our wood management, by providing a State Model Forest in connection with the existing School of Forestry at Edinburgh. The difficulties which oppose themselves to private action in this direction are so strong, and the importance of the interests involved are so great, that it may confidently be said that of all enterprises to which the State might offer aid or encouragement, forestry is that which has the strongest claims on the consideration of the Government.

(v.) The Proposed School of Forestry. By Sir Dietrich Brandis, K.C.S.I.

[*Transactions of the Royal Scottish Arboricultural Society, Vol. XII., Part i.*, 1888.]

After alluding to the great differences between the forest conditions of India and Scotland, particularly as regards rights of users, and State and individual proprietorship, attention is directed to the manner in which forest business is managed on the continent of Europe.

In Prussia, for instance, the area of the State forests alone amounts to 6,600,000 acres. More than twice this area is in the hands of towns, villages, public corporations, and private individuals. The whole of the large forest area of Prussia—upwards of 22,000,000 acres—is managed on a regular system, with the object of maintaining a uniform annual yield in wood, timber, and other forest produce, the amount of which over a large portion of the area is slowly increasing every year, as the result of the steady improvement which takes place in the condition and, consequently, the productive powers of the forests. The number of the superior officers entrusted with the management of the Prussian State forests is 807.

The training of the superior forest officers in Prussia consists of a practical apprenticeship of one year in one of the State forest districts after leaving the public school, two years' study in a forest school, one year at a university, and two years' practical work in several forest districts. Examinations have to be passed at the end of the university course, and again after the two years' practical work, after which the candidate is eligible for the State service. At this time the candidate is usually about 26-27 years old. Generally, however, he has to wait a few years before obtaining a permanent Government appointment in the lowest grade of the superior staff. Those who do not obtain such posts find employment in forests belonging to towns, villages, corporations, or private individuals. In other parts of Germany the arrangements are similar: everywhere a thorough and prolonged professional training, partly practical, partly theoretical, is required of candidates for the superior State service.

It is hoped that the course of training for the highest appointments in the Indian service, which is at present two years at Coopers Hill, will ultimately be made as thorough as is the case in Germany. But such a course as this is not of special interest to Scotland, where the requirements of wood-managers and foresters are entirely different from those of Indian forest officers. The elaborate professional and scientific training of those who aspire to the highest posts in India should be kept entirely distinct from the establishment of forest schools for wood-managers and foresters in this country.

In Prussia and other countries of the continent of Europe, the State is the largest forest proprietor; moreover, it is justly held to be the duty of the State to watch over the good management of the forests which belong to towns, villages, and public corporations. It is different in Great Britain, where, out of a total area under timber of about 2,800,000 acres, the Crown has only about 100,000 acres, while the rest belongs to private proprietors. In the United Kingdom the condition of things is similar to that which exists in some parts of Austria, notably in Bohemia and Moravia, where the large forest proprietors have formed two associations for the purpose of providing professional education for young men who desire to enter their service as wood-managers or foresters. The professional education for the State forest service in Austria was considered too high and too expensive for the requirements of these private estates; the proprietors therefore determined to help themselves. The Bohemian school at Weisswasser was established in 1855; students are required to pass through a middle-class school, and to serve a practical apprenticeship of twelve months, after which the course of studies at the school occupies two years. A forest district of 2,900 acres, belonging to a private owner, is attached to the school, and placed under the control of the director for purposes of practical instruction. Under the director is a staff of five professors, one for those branches of forestry not taught by the director himself, one for mathematics and surveying, two for natural sciences, and one for drawing and book-keeping. Eulenberg, the school maintained by the Association of Forest Proprietors of Moravia and (Austrian) Silesia, was founded in 1851, and has a similar organisation. No fees are paid by sons of foresters.

As soon as the desire gains ground among proprietors in Scotland to obtain for their estates the services of wood-managers and foresters who have received a more systematic professional training than is attainable at present, they will find the needful means and take the needful steps for the establishment of a forest school. It clearly is their interest to increase the annual yield, and to improve the productive powers, which means the capital value, of their estates. These ends may to some extent be accomplished by a more systematic management of their woodlands, and this again will be promoted by giving to foresters a more systematic training in their profession than they receive at present.

The natural and proper thing in the present case is for the proprietors to take action on their own account. Should this, however, not be the case, and

should the Royal Scottish Arboricultural Society feel themselves strong enough to take the initiative in such an undertaking, this would be an excellent and most important step. The large landed proprietors might perhaps afterwards be disposed to take up the scheme and work it out on their own account. Something of this kind took plate at Weisswasser, which was at first established by the Bohemian Forest Society, and which was thus continued until 1862, when the forest proprietors of the province took over the institution.

Much of the highest interest to the forester may be seen and learnt in the Scottish woodlands. Different methods of forestry have been practical under widely different circumstances, in some cases with marked success, while in other cases there have been failures. A forest school, if the teaching is of the proper kind, will contribute much to a better understanding of the circumstances which have led to success in the one case and to failure in the other. The students will be taught to observe accurately, to combine their own observations with the theoretical knowledge they have acquired, and this will eventually enable them to draw correct conclusions from the facts which they have observed. The school, if well directed, ought to become a centre of scientific research, the results of which will contribute much to a more successful management of the woodlands.

(vi.). PRESIDENT'S ADDRESS, ROYAL SCOTTISH ARBORICULTURAL SOCIETY. By ISAAC BAYLEY BALFOUR, F.R.S., August 1891.

[*Trans. Roy. Scot. Arb. Soc., Vol. XIII., Part ii.*, 1892.]

The society has from the first perceived that the way to improve forestry was by educating those who have the care and management of woodlands, and this object has been steadily pursued. Not until it had attained its majority, however, did the society see the first step taken in this direction—viz., the acquisition by the Town Council of Edinburgh and the Crown of what is now the Arboretum. The next important step was the organisation of the Forestry Exhibition at Edinburgh, partly with the view of obtaining funds for the endowment of a chair, though these hopes were not realised. The appointment of the Select Committee on Forestry in 1885, which, however, led to nothing, may also be traced to the society's efforts. A fresh impetus was given in 1889 by the arrival of Dr. Somerville as lecturer at Edinburgh University, with the assistance of a temporary grant of £100 per annum towards his salary from the newly established Board of Agriculture. Apart from university work, a short course of lectures was begun at the Royal Botanic Gardens by him and the Keeper of the Garden during the winter months.

The necessity of forest education is now fully recognised; what is wanted is practical support from those whose interest it is to encourage good forestry. As far as possible, existing institutions must be utilised; schemes for the creation of a forest school in a district surrounded by forests would involve a maximum of cost.

There are two classes requiring education: (1) Those who can afford university education—owners, land agents, and persons proposing to enter the higher grades in India or the Colonies; and (2) the practical forester, below university grade.

In the university a student can already obtain instruction in all the sciences underlying forestry; and application has been made to the Universities Commissioners to recognise forestry as an applied science, on the same footing as engineering and agriculture, by the institution of a chair of forestry.

The chief difficulty with the working foresters is the maintenance of the pupil during the period of instruction; bursaries would help them to some extent, but not sufficiently. Prof. Balfour believes that it can best be done by utilising the Royal Botanic Garden, and he has submitted to his department a scheme, according to which students would be enrolled as workmen, and while receiving the usual wages and performing all the regular labour of the Garden, would attend lectures twice a week on forestry and cognate subjects for a period of two or three years without fee. Only a limited number could thus be received as "garden pupils," but arrangements might be made to admit others to the courses. The expense he puts at not more than £150 per annum for lectures.

(vii.). PRESIDENT'S ADDRESS, ROYAL SCOTTISH ARBORICULTURAL SOCIETY: By ISAAC BAYLEY BALFOUR, F.R.S., August, 1892.

[*Trans. Roy. Scot. Arb. Soc., Vol. XIII., Part iii.*, 1893.]

In continuation of his address in the previous year, Prof. Balfour noted, with regard to university education in forestry, that the Edinburgh University lectureship, vacated in 1891 by Dr. Somerville, had been continued under Colonel Bailey. Some money had also been raised, but only about a fourth of the sum required, towards the endowment of a chair of forestry. The position of forestry had also been recognised by the Universities Commissioners approving it as an optional course for the degree of science in agriculture. Prof. Balfour urged the necessity of its being a compulsory subject.

As regards training of practical foresters, a great advance had been made by the sanction of the scheme drawn up by himself for the education of pupils who should maintain themselves during the period of instruction as workmen in the Royal Botanic Gardens. Arrangements had been accordingly made to take foresters or gardeners, with at least three years' previous practical experience, as employees receiving regular wages in the Garden for two and a-half years; while several nurseries about Edinburgh had also agreed to take such men and allow them to attend the courses, which would be arranged so as not to interfere with the daily work.

(viii.). FORESTRY IN BRITAIN: PRESIDENT'S ADDRESS TO THE BIOLOGICAL SECTION OF THE BRITISH ASSOCIATION, 1894. By ISAAC BAYLEY BALFOUR, F.R.S.

[*British Association Report*, 1894, *p.* 667.]

Forests are of importance to a country from two aspects—as a source of timber and fuel, and on account of their hygienic and climatic influences. These latter have now been clearly demonstrated. Stated generally, forests improve the soil drainage, exercise a purifying effect upon the air, prevent the dissemination of dust particles with their contingent germs, reduce extremes of temperature, increase the relative humidity of the air and the precipitation in rainfall, and protect and control the waterflow from the soil.

Forests in this country are not of great importance as a source of fuel, but the insufficiency of our woodlands to supply our requirements of timber is shows by our large annual imports, a considerable proportion of which could be grown at home. The consumption of timber will probably increase; science will no doubt, as in the past, find substitutes for many objects for which wood is now used, but, on the other hand, this saving will probably continue to be counterbalanced by the greater utilisation of wood in new directions. There is abundant evidence that the present rate of timber consumption is in excess of the present reproduction in the great timber supplying countries. In Northern Europe the supplies are rapidly diminishing—even Sweden is beginning to import logs from America—and both Canada and the United States are beginning to show signs of exhaustion.

Great Britain has a far smaller area under wood than other countries, and the area under State woods is also much less, although State proprietorship abroad is not so large as is sometimes supposed. But continental States recognise the national importance of forests; and the example they set in the management of their own

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woods, their readiness to give advice, and the education they provide, have resulted in the private woods being as well managed as those of the Government; whereas in this country the State forests cannot in any sense be regarded as models, and in the New Forest legislation has even prohibited the practice of forestry.

Some of the mismanagement of our woodlands is due to the conditions of land tenure; copyholders can hardly be expected to plant. Game is also frequently preferred, and is often more remunerative. Much mismanagement is also due to want of scientific knowledge on the part of landowners; while the operations of planting for posterity, with very rare possibilities of any return to the planter, make demands upon the landowner to which he is unequal.

It is sometimes said that wood will not pay in Britain; and the home grower is certainly handicapped to some extent. The use of foreign timber only is often specified in building contracts, and even the Post Office two years ago debarred the employment of native timber for telegraph poles. Yet the quality of home timber is quite as good as foreign. The grower suffers also by not maintaining a steady and regular output. This can be remedied by proper management, and an instance may be quoted of larch yielding 9s. per acre, after paying all expenses, while contiguous land was only worth 1s. or 2s. per acre as grazing. The woods also give considerable employment, and thus help to retain the rural population on the land. In the instance just quoted the outlay for labour amounted to 31s. per acre per annum.

The State ought to treat its forest areas in a reasonable and scientific manner, and be prepared to incur the opposition of those who regard all scientific handling of woods as vandalism. Such tracts properly treated might serve as instruction areas. The creation of some such experimental teaching stations in Government forests is one of the essentials for forestry in Britain; and the area of State ownership should even be increased to provide centres of instruction, with an acreage sufficient to allow of a satisfactory rotation, in other parts of the country.

The general ignorance regarding forestry was recognised by the Select Committee in 1887, and in their report they recommended as remedy the appointment of a Board of Forestry. This is now rendered unnecessary by the formation of the Board of Agriculture, which body ought, however, to have competent scientific advisers upon its staff, and such an expert in forestry would do much to increase sound technical knowledge in Britain.

The few courses on forestry at various institutions started since the report of the Committee was issued, mostly with the aid of grants from the Board of Agriculture and local help, are nothing to what is required. Two points arise in connection with the provision of a complete scheme of forestry instruction—viz., where are the funds to come from, and where are we to get the teachers?

As regards the funds, the Board of Agriculture will no doubt be willing to contribute, but their aid will be dependent upon local support. It is to the county councils that we must look for the necessary endowments, with, it may be, some assistance from private benefactors; while the Government must provide the sylvicultural areas for practical instruction. But before we can get the county councils to move, the nature of the national interests involved must in the first place be made more widely known.

For the teachers, we must look to the botanists. It was its utilitarian side, and its practical application to medicine, which gave the first impetus to the study of botany. But this science subsequently became less practical, and botanists have failed to recognise the natural outlets of their study. Modern botanical study should, through forestry, find a sphere of application by which it may contribute to our well-being. For the present we must depend for our teachers upon men trained abroad, but the studies of botanists can be so moulded as to put them on the track of this practical subject.

(IX.). Report on a Visit to the Forests of Scotland, Aug., 1896. By Dr. Adam Schwappach, Professor of Forestry in the Prussian Forest School of Eberswalde, and Director of Prussian Forestry Investigation.

[*Trans. Roy. Scot. Arb. Soc., Vol. XV., Part i.*, 1896.]

Professor Schwappach visited the woods in the districts of Loch Lomond (Airthrey, Keir, Blair Drummond, Lanrick Castle), Fort William, the Caledonian Canal, Inverness, Strathspey, and Strathtay. He found "the most scientific system of forestry, according to German notions, in the large pine forests belonging to the Countess of Seafield, in the neighbourhood of Grantown. . . . The older woods are showing satisfactory growth and, with the exception of those in the neighbourhood of the castle, are exclusively regenerated by naturally-sown seed. At Curr Hill it was an interesting experience for me to find a wood about twenty years old and a hundred acres in extent, which had been regenerated naturally, and which was showing a density and uniformity which, without artificial assistance, could not have been obtained in Germany, where the young trees suffer much during the felling of the seed-trees." In other woods on the estate he found things less satisfactory, and he expressed the opinion that it would certainly have paid to give more attention to filling up by artificial planting gaps that were left in the naturally-sown woods. He also reported: "When at Grantown, I had also the pleasure of inspecting a wood, about twenty years old, . . . which had been established by planting, and which was growing in a most satisfactory manner . . . The main difference in the management of woods in Scotland and in Germany is found in the manner of thinning. The specimens of thinning that I met with at Dunkeld, Scone and Airthrey were entirely opposed to what we consider good practice in Germany. . . . It seemed to me . . . that woods are greatly overthinned in Scotland. . . . The great mistake that Scottish foresters make is to start thinning too early, in order to give the trees sufficient room to develop large crowns, and to grow rapidly in thickness . . . However desirable early returns may be from the point of view of the landlord or of the forester, the fact must not be lost sight of that they are obtained at a great sacrifice . . . At Scone Palace, I inspected a very fine oak-wood, 90-100 years old. The trees were showing vigorous growth, and one can only regret that the ground was not more fully stocked, as would have been the case under a different system of management, and which would have resulted in the production of finer and more valuable stems." Between Callander and Balmaha he saw much oak coppice. "But, with tanning bark as the main object, the manner of thinning appeared to leave much to be desired."

He discusses the afforestation of waste lands, at present used for grazing and sporting. "The annual grazing and sporting rent from such areas appears to fluctuate between 6d. and 2s. 6d. per acre. The question then comes to be whether forestry offers the opportunity of improving the revenue from such land. The favourable climate of Scotland and the comparatively easy slopes of its mountains, make it unnecessary to undertake forestry operations for the improvement of the climate, or the fixation of the soil upon the hills. The ease with which coal may be got in that country, and the facilities which it enjoys—at least for the present—for the importation of timber from abroad, make it unnecessary that planting should be undertaken either for the purpose of providing a supply of fuel or of structural timber. The possibilities of the afforestation of the waste lands of Scotland, must therefore be regarded entirely from the financial point of view. Whether forestry will be financially successful or not will to some extent depend upon whether the question is regarded from the national point of view, or from the standpoint of the owner of the woodlands for the time being.

"Regarded from the point of view of the national weal, the question comes to be whether forestry offers the possibility of permanently increasing the nett revenue from the land. In my opinion this question must undoubtedly be answered in the affirmative, at least so far as the better classes of soil are concerned, and for the following reasons. Assuming that the Scots fir is employed, with a rotation of eighty years on soil of the third class and, further, allowing 2½ per cent. on the invested capital, a percentage which for Britain errs on the side of being rather too high than too low,

we have the following items of expenditure and revenue, so far as they refer to the first rotation:—

EXPENDITURE PER ACRE.

1. Value of land worth 1s. 6d. per annum at twenty-five years' purchase - -	£1 17 6
2. Planting and beating up - - -	1 10 0
3. Annual outlay for supervision, protection, rates and taxes, and road-making - - - - - - -	0 2 0

"By the methods of computation employed in forest valuations, the deferred value of these items of expenditure, with compound interest, at the end of eighty years amounts to about £49.

"According to my investigations, the final felling and the deferred value of the intermediate returns (thinnings) allowing, however, only 2 per cent. interest on the latter, will amount at the end of eighty years on soil of the third class to £87. Distributed over eighty years, the balance of £38 gives an annual revenue of just over 3s. per acre, which compares with a former rental of 1s. 6d.

"Although nothing has been allowed on account of game in the above calculations, it is not to be supposed that no revenue will be derived from this source during the whole period of the rotation. On the contrary, the game rent, during the second half of the rotation of a German forest, amounts to a very considerable sum.

"Apart from the increase of revenue, the afforestation of land is of great national importance as a labour-employing industry. Land under wood can maintain a larger population than land under rough pasture. From the national point of view, it is manifestly also an advantage to produce timber at home, and so dispense with its importation from abroad. This matter is of special importance, in view of the fact that many countries which at present export timber must in the near future cease to do so. Many of these countries are exploiting their forests in such a reckless manner that their stock of timber will soon be exhausted."

He derived most pleasure in his tour from the opportunities he had of inspecting the exotic conifers so common in many of the parks and pleasure-grounds of Scotland. It is only within the last 20 years that much attention has been given to this subject in Germany, so that the much older exotics which Prof. Schwappach met with proved of special interest to him. "The parks which I visited differed in character and situation to some extent, but all of them were pictures of sylvan beauty. To a stranger accustomed to a Continental climate, the splendid collections of conifers came as a revelation, and it would be difficult to say which of them was the most interesting. To me, as a forester, Murthly appeared as the pearl of them all. It was here that I found American conifers in the greatest abundance and of the largest size, and the trees had been treated here more as one is accustomed to meet with them in the forests. The magnificent development of the different species, and the picturesque and artistic manner in which they were grouped, with luxuriant specimens of rhododendrons, hollies, bay laurels, and other plants, combined with the beautiful velvety turf of the Scottish lawn, produced an impression never to be effaced. Seeing that some of the more important European trees do not in all cases grow very satisfactorily in Scotland, I should recommend that the North American conifers should be planted on a larger scale, as is now being done in Germany. The spruce, for instance, does not yield a satisfactory growth in many parts of Scotland, and this is also found to be the case near the sea coast in other countries, as, for instance, in Schleswig-Holstein. Many parts of Scotland, also, do not offer what I would consider very suitable conditions for the growth of the Scots fir. True, rabbits will materially interfere with the success of the cultivation of exotic trees and with forestry operations in general, but there is no reason at all why this difficulty should not be overcome.

"Not only do many of the exotic trees give a larger yield of timber than the indigenous species—compare, for instance, the yield of woods of Scots fir and Douglas fir of similar age at Scone—but they also furnish timber of superior quality. This point gains additional importance in view of the fact that the American supply of timber of many valuable species is within measureable distance of extinction. Scotland possesses the most favourable natural conditions for producing those high class timbers which America will soon cease to supply. I regard the evidence of the successful growth of exotic trees in the parks of Scotland as of far greater natural importance than the beautifying influence which these trees exert upon the landscape. . . . In conclusion, I may shortly summarise the points that appeared to me to have the most important bearing on the future of forestry in Scotland:—

1. In selecting the trees to be cultivated, more regard should be paid to the character of the situation.
2. The stocking, whether artificial or natural, should be denser. In the latter case, gaps amongst the seedlings should be early and carefully filled up by artificial transplantation.
3. The woods should be managed on sylvicultural principles, and not in the park-like manner at present in vogue.
4. The operation of thinning should be conducted in a more rational manner, and with more regard to the future of the wood.
5. A broader view should be taken of the whole financial aspects of forestry. The success of forestry operations cannot be judged from the æsthetic point of view, nor can it be gauged by the immediate returns; it can only be determined by the difference between the deferred or final sum of all the items of revenue and of expenditure.
6. Considerations of sport should be permissible only when they do not interfere with the production of timber, which is, of course, the main object of forestry."

(x.) BRITISH FORESTRY AND ITS FUTURE PROSPECTS. By JOHN NISBET, D.OEC.

[Trans. Roy. Scot. Arb. Soc., Vol. XVI., Part iii., 1900.]

In former times, the growth of oak was encouraged in view of the necessities of the Navy, but, with the substitution of iron for timber, etc., of late years, the need for hardwoods has become less pressing. Great quantities of teak, etc., are now imported, and with regard to these particular classes of hard woods, neither the present nor the future condition of the forests in Britain will exert much influence upon the market demand, and it is probable that increased supplies, not yet remunerative, will become available in the future.

It is otherwise with the light woods. Of the total imports of £25,378,000 for timber and other tree-products in 1899, we spent about £18,000,000 on coniferous wood alone, which could easily and profitably be grown at home. And these imports have increased of late years. The two great sources of supply of coniferous wood are the Baltic countries and Canada; and the demands of industrial countries, especially of Germany, in the case of the first-named, and of the United States in the second, will absorb a very large proportion of their available surplus. Canada uses about £16,000,000 worth of timber per annum, the value of the wood-products exported being £5,000,000 to £6,000,000. The United States cannot meet its own requirements of timber, and the growth of industries, more especially the extraordinary development of the manufacture of wood-pulp, must make very heavy demands on the Canadian supplies in future.

These circumstances render a rise in the price of timber certain, and the days of cheap timber in Great Britain are almost at an end. Britain's requirements cannot be entirely met at home; even if the 3,000,000 acres of woodlands were trebled, and were in a fully stocked condition, they would only just supply existing needs, without any margin for expansion of industries. And, with few exceptions, British woods are neither fully stocked nor well managed. There have been of late, however, some hopeful signs that landowners are awakening to the fact that their woods might be improved, and several have had working plans drawn up by experts. For the proper management of woods, and a regular revenue, a working plan is essential.

State aid for instruction in forestry is wanted on a more generous scale than has hitherto been given. At present the only thorough instruction given is at Cooper's Hill, but the expense there is too heavy. The State

Appendix II.

should provide either a national school, or cheap courses at some of the universities and agricultural colleges, or, rather, technical schools. The courses at Edinburgh University, Newcastle, and the Botanic Garden at Edinburgh—all State-aided—are only initial steps in the proper direction. All important European States have one or more forestry schools, and even the State of New York has founded a College of Forestry with 30,000 acres of demonstration forest.

There are many works on sylviculture, and doubtless the State and other landowners who may have had working plans drawn up will allow their estates to be inspected by students. It therefore seems far more important to provide first of all thoroughly adequate, cheap, and easily obtainable instruction than to acquire and work a State model forest in Scotland.

Substantial encouragement and assistance must also be given by the State to induce landowners to adopt economic forestry. The Government might give facilities for the advancement of money at a low rate of interest; the management, if necessary, being subject to the approval of the Board of Agriculture. There are objections to the State lending such money directly, but amendments in the necessary direction might be made to the Lands Improvement Act, etc.

Other difficulties in the way of economic forestry are the rating of woodlands, the law as regards damage by sparks from railway engines, and rabbits.

(xi.) The Outlook of the World's Timber Supply. By Dr. W. Schlich, C.I.E., F.R.S.

[Journal of the Society of Arts, March 1, 1901.]

I shall begin with Europe, and then deal with non-European countries. My data referring to the former are fairly complete, which, however, cannot be said of those referring to the latter.

The first table to which I desire to invite your attention is that which shows the areas classed as forests in the several European countries.

Table I.

Showing the Area of the Forests of Europe.

Countries.	Area of Forests, in Acres.	Percentage of Total Area of Country under Forest.	Percentage of Forest Area belonging to the State.	Forest per Head of Population, in Acres.
1. Sweden	48,000,000	44	27	8·9
2. Norway	17,000,000	21	12	8·4
3. Russia, including Finland	516,000,000	40	61	5·9
4. Bosnia and Herzegovina	6,790,000	53	70	4·9
5. Bulgaria	10,650,000	45	—	3·2
6. Spain	20,960,000	17	84	1·3
7. Hungary	22,420,000	28	16	1·3
8. Austria proper	23,990,000	32	7	1·0
9. Servia	2,390,000	20	—	1·0
10. Roumania	5,030,000	17	47	1·0
11. Greece	2,030,000	16	80	·9
12. Luxembourg	190,000	30	—	·9
13. Switzerland	2,100,000	20	4	·7
14. Germany	34,490,000	26	33	·7
15. France	23,530,000	18	12	·6
16. Italy	10,110,000	14	4	·3
17. Denmark	600,000	6	24	·2
18. Great Britain	3,030,000	4	3	·1
19. Belgium	1,250,000	17	5	·1
20. Portugal	770,000	3	8	·1
21. Holland	570,000	7	—	·1
22. Turkey	6,180,000	8	—	—
	758,080,000	31	—	2·

This table at once introduces some very useful information, the main points of which may be sumarised as follows:—

1. Not quite one-third of the area of Europe is classed as forest.

2. The average forest area per head of population ranges from 9 acres to one-tenth of an acre, the average being about 2 acres.

3. I have underlined the areas referring to the exporting countries. Of these, only Austria-Hungary and Roumania have less than 2 acres per head of population; all other exporting countries have from 5 to 9 acres of forest per head of population.

Appendix II

Table II.

Showing the Net Imports and Exports of European Countries.

(Average data, calculated from the returns of the last five years, whenever available.)

Countries.	Quantities in Tons.		Values in £ Sterling.	
	Imports.	Exports.	Imports.	Exports.
Great Britain and Ireland	9,290,000	—	22,190,000	—
Germany	4,600,000	—	14,820,000	—
France	1,230,000	—	3,050,000	—
Belgium	1,020,000	—	4,100,000	—
Denmark	470,000	—	1,250,000	—
Italy	420,000	—	1,250,000	—
Spain	210,000	—	1,180,000	—
Holland	180,000	—	720,000	—
Switzerland	170,000		590,000	—
Portugal	60,000	—	200,000	—
Bulgaria	50,000	—	50,000	—
Greece	35,000	—	130,000	—
Servia	15,000	—	15,000	—
Roumania	—	60,000	—	180,000
Norway	—	1,040,000	—	1,870,000
Austria-Hungary with Bosnia and Herzegovina.	—	3,670,000	—	10,800,000
Sweden	—	4,460,000	—	7,930,000
Russia with Finland	—	5,900,000	—	8,900,000
Total	17,750,000	15,130,000	50,445,000	29,680,000
Net Imports	2,620,000	—	20,765,000	—

It will be observed that the following countries import (net) timber in a descending scale:—Great Britain and Ireland, Germany, France, Belgium, Denmark, Italy, Spain, Holland, Switzerland, Portugal, Bulgaria, Greece and Servia. The exporting countries are Russia (with Finland), Sweden, Austria-Hungary (with Bosnia and Herzegovina), Norway and Roumania. There is a deficiency of 2,620,000 tons for the whole of Europe.

Of the importing countries the first four demand special attention.

Great Britain and Ireland.

Table III.

Showing the Mean Annual Imports of Timber into Great Britain and Ireland.

Period.	Mean Annual Imports in Tons.
1864	3,396,000
1864–68	3,528,000
1869–73	4,459,000
1874–78	5,844,000
1879–83	5,789,000
1890–94	7,628,000
1895–99	9,290,000
1899 only	10,008,000

Mean annual increase of Imports during 35 years, 189,000 tons. Large and continuous as this increase is, it must be pointed out that the imports have risen very rapidly of late years, as the following figures will show:—

	Tons.	Value.
		£.
Mean annual net imports, 1895–99	9,290,000	22,190,000
,, 1890–94	7,628,000	17,595,000
Mean annual increase	332,000	919,000
Mean annual increase in per cent. of imports.	4·4%	5·2%

These percentages show that the value has risen more rapidly than the tonnage; in other words, that the mean price per ton has increased by 18 per cent. in the course of five years. In order to probe this question further, I have calculated the average prices of all coniferous timber imported during the years 1895-99, obtaining the following results:—

Average Price per Ton of Coniferous Timber Imported.

	£.	s.	d.
1895	1	17	7
1896	1	19	10
1897	2	2	2
1898	2	2	7
1899	2	3	2

These data indicate a slow but steady rise in prices equal to 15 per cent. in five years.

For the purpose of showing where all this timber comes from, I attach the following table.

TABLE IV.

Giving details of the Timber imported into Great Britain and Ireland, during the Year 1899.

Country whence imported.	Quantity in Loads.								Value in Pounds Sterling.							
	Fir, hewn and sawn.	Oak, hewn and staves.	Teak.	Mahogany.	Other furniture and fancy woods.	House frames, fittings, &c.	Miscellaneous.	Total.	Fir, hewn and sawn.	Oak, hewn and staves.	Teak.	Mahogany.	Other furniture and fancy woods.	House frames, fittings, &c.	Miscellaneous.	Total.
British Possessions:																
Dominion of Canada	1,767,531	25,546	—	—	9,200	15,398	79,361	1,897,036	4,373,002	141,336	—	—	50,383	61,594	258,447	4,844,762
Newfoundland	62,299	—	—	—	—	—	—	62,299	88,350	—	—	—	—	—	—	88,350
West Indian Islands, Honduras, Guiana	—	—	—	14,455	4,315	—	3,001	21,771	—	—	—	131,392	30,527	—	19,081	181,000
West Coast of Africa and Cape Colony	—	—	—	26,782	1,833	—	—	28,615	—	—	—	256,037	15,042	—	—	271,079
East India and Straits Settlements	—	—	51,649	—	4,989	1,592	—	58,230	—	—	625,946	—	38,486	6,369	—	670,801
Australasia	5,782	—	—	—	131,894	212	—	137,888	29,538	—	—	—	544,894	846	—	575,278
Other British Possessions	4,320	24	12	363	185	555	4,093	9,552	4,320	139	150	2,988	1,240	2,221	4,630	15,688
Total British Possessions	1,839,932	25,570	51,661	41,600	152,416	17,757	86,455	2,215,391	4,495,210	141,475	626,096	390,417	680,572	71,030	282,158	6,686,958
Foreign Countries:																
Russia	2,141,800	51,676	—	—	1,354	4,805	42,293	2,241,928	4,783,879	239,461	—	—	18,437	19,220	79,751	5,140,748
Sweden	2,322,613	10,423	—	—	—	37,025	25,538	2,395,599	5,008,719	27,354	—	—	—	148,101	53,890	5,238,064
Norway	826,377	24,058	—	—	—	1,665	11,027	863,127	1,790,940	64,171	—	—	—	6,658	31,389	1,893,158
Denmark	2,466	—	818	—	—	1,878	—	5,162	4,122	—	10,415	—	—	7,511	—	22,048
Germany	309,580	44,972	—	4,736	2,915	34,146	6,852	403,201	741,002	332,291	—	38,478	24,611	136,583	17,927	1,290,892
Holland	295	385	101	—	1,450	28,286	8,194	38,711	1,305	3,206	1,120	—	9,597	113,144	38,016	166,388
Belgium	10	648	—	—	922	33,859	—	35,439	41	3,460	—	—	11,089	135,437	—	150,027
France	771,673	260	58	834	2,209	36,239	13,940	825,213	605,423	1,232	695	8,634	34,213	144,958	39,598	834,753
Spain and Portugal	49,314	—	—	—	—	—	—	49,314	38,889	—	—	—	—	—	—	38,889
Italy	—	—	—	—	242	615	—	857	—	—	—	—	2,193	2,640	—	4,653
Austria	—	9,882	—	—	—	1,062	—	10,944	—	99,198	—	—	—	4,248	—	103,446
Turkey and Greece	—	—	—	—	618	—	—	618	—	—	—	—	10,536	—	—	10,536
West Coast of Africa	—	—	—	6,687	409	—	—	7,096	—	—	—	66,639	2,460	—	—	69,099
Egypt	—	—	—	—	—	820	—	820	—	—	—	—	—	3,278	—	3,278
United States of America	540,119	128,608	—	9,693	71,973	162,086	79,290	991,769	1,532,116	705,519	—	102,219	520,851	648,346	361,008	3,870,059
West Indies, Mexico, Central, and South America	—	—	—	8,543	3,480	—	—	12,023	—	—	—	78,763	27,140	—	—	105,903
Other Foreign Countries	474	303	1,292	942	1 484	1,113	1,684	7,292	2,014	1,893	15,975	8,799	7,672	4,451	7,285	48,089
Total Foreign Countries	6,964,721	271,215	2,269	31,435	87,056	343,599	188,818	7,889,113	14,508,450	1,477,785	28,205	303,532	668,799	1,374,395	628,864	18,990,030
Grand Total	8,804,653	296,785	53,930	73,035	239,472	361,356	275,273	10,104,504	19,003,660	1,619,260	654,301	693,949	1,349,371	1,445,425	911,022	25,676,988
Exports	—	—	—	—	—	—	—	97,090	—	—	—	—	—	—	—	486,530
Net Imports	—	—	—	—	—	—	—	10,007,504	—	—	—	—	—	—	—	25,190,458

Table V.

Showing the Amount of Timber Imported in 1899.

	Per Cent of the Total Quantity.
Coniferous timber	87
Oak	3
Teak	·5
Mahogany	·7
Other furniture woods	2·4
House and door frames, &c.	3·6
Miscellaneous timber	2·8
Total	100·0

GERMANY.

Table VI.

Showing the Mean Annual Net Imports of Timber into Germany.

Period.	Mean Annual Net Imports in Tons.
1842–64	13,000
1865–69	913,000
1870–74	1,992,000
1875–79	1,692,000
1880–84	1,186,000
1885–89	2,075,000
1890–94	2,796,000
1895–99	3,200,000
1899 only	4,600,000
Mean annual increase during 35 years	131,000 tons.
Mean annual increase during the last 10 years	167,000 „
Value of the net imports in 1899	£14,820,000

The gross imports of timber into Germany in 1898 came from the following countries:—

From Austria-Hungary	1,883,000 tons.
„ Russia	1,831,000 „
„ Sweden and Norway	570,000 „
„ North America	262,000 „
Total gross imports	4,546,000 „

Of these quantities about 13 per cent. were hard woods and 87 per cent. coniferous timbers.

The following additional information may prove interesting:—

	£	£
Annual production of timber in the German forests		15,000,000 tons.
Ditto firewood		23,000,000 „
Total timber and firewood		38,000,000 „
Annual gross receipts from forests	21,500,000	
Annual costs for staff, labour, &c.	8,600,000	
Annual net receipts		12,900,000

About 1,000,000 people live by work done in the forests, and about 3,000,000 people by work connected with forest industries.

FRANCE.

The following data show the mean annual net imports of timber into France:—

Table VII.

Showing the Net Imports of Timber into France.

Period.	Value of Net Imports in £.
1865	4,640,000
1865–69	5,584,000
70–74	4,249,000
75–79	6,588,000
80–84	7,828,000
85–89	5,189,000
90–94	4,493,000
95–99	4,032,000
1899 only	4,053,000

The net imports have fluctuated, but there has practically been no increase during the last 35 years. The mean annual quantity imported during the last five years amounts to 1,230,000 tons. The imports come from Austria-Hungary, Sweden, Norway, Germany, Russia, North America, and Switzerland. The production of the French forests is given as follows:— Appendix M.

Timber	4,200,000 tons.
Firewood	14,000,000 „
Total production	18,200,000 „

The excessive proportion of firewood is due to the preponderance of coppice woods, and coppice with standards.

BELGIUM.

	Tons.	Value.
Net imports in 1898	1,020,000	4,100,000
Mean annual increase in net imports since 1865	22,000	
Mean annual increase during the last ten years	44,000	
Do. in 1899	80,000	

OTHER IMPORTING COUNTRIES.

The increase in other European countries is comparatively small. The net imports of Switzerland have during the last 10 years increased by about 17,000 tons a year, and those of Denmark by 20,000 tons. In all other countries together, the net increase may be placed at about 20,000 tons a year, or a total of 57,000 tons.

SUMMARY OF ALL IMPORTING COUNTRIES.

The total annual increase in net imports of all European countries of late years stands as follows:—

	Tons.
Great Britain and Ireland	332,000
Germany	167,000
Belgium	44,000
Other European countries, say	57,000
Total annual increase	600,000

If the same rate of increase lasts for another 10 years, an additional 6,000,000 tons will be required in 1910.

It will be useful to see what the present total consumption in the four principal importing countries is. The following statement shows this:—

Table VIII.

Showing the Annual Consumption of Timber in the Four Principal Importing Countries of Europe.

Countries.	Home Production of Timber in Tons.	Net Imports in Tons.	Total Consumption in Tons.	Number of Cubic Feet consumed per head of population.
Great Britain and Ireland	2,000,000	9,290,000	11,290,000	14
Germany	15,000,000	4,600,000	19,600,000	18
Belgium	600,000	1,020,000	1,620,000	12
France	4,200,000	1,230,000	5,430,000	7
Total	21,800,000	16,140,000	37,940,000	13

These data are based on reliable information, with the exception of the home production in Great Britain and Ireland, which has been estimated from the area of the forests and the yield of hedgerows, parks, etc. Considering that the consumption of timber in Britain has, during the last 20 years, *increased at more than twice the rate of the increase in population*, and that a similar process is going on in Germany and Belgium,

Appendix II.

I do not doubt for a moment that the consumption in the above four countries will in a few years have risen to 20 cubic feet per head of population.

I shall now proceed to deal with the exporting European countries:—

Roumania.

Roumania has only about one acre of forest for every head of population. It has exported lately about 60,000 tons of timber annually. Even if this quantity should, in the immediate future, be somewhat increased, the rise, if any, will be so small that we can neglect it.

Norway.

	Tons.	Value.
Present annual net export -	1,040,000 -	£1,870,000

Of late the major part of the exports went to Britain, France, Belgium, Holland, and to Germany.

The exports have not increased during the last 10 years; on the contrary, they have slightly fallen. Of the total forest area, 17,000,000 acres, only 12 per cent., or 2,040,000 acres, are State forests, and 500,000 acres Corporation forests. The remaining 14,460,000 acres are private forests, which are worked without any legal interference on the part of the State. The manufacture of paper pulp has assumed great dimensions, requiring annually already 1,400,000 tons of timber. A considerable portion of the forests is situated at a high altitude where growth is slow. All authorities are agreed that the Norwegian forests as a whole have been considerably over-worked, and that a decided falling off in the export must set in almost immediately.

Austria-Hungary, Including Bosnia and Herzegovina.

	Tons.	Value.
Present annual net export -	3,670,000 -	£10,800,000

The exports have been developed since the year 1855; they have increased during the last 10 years by 158,000 tons a year, which is equal to about 7 per cent. Of the exports:—

	Per cent.
Germany received in 1897 - - - -	56
Italy ,, ,, - - - - -	18
Russia and the Balkan received in 1897 -	10
France received in 1897 - - - -	6
Switzerland received in 1897 - - -	3
Other countries received in 1897 - -	7
Total - -	100

The following data show the distribution of the forest area according to proprietorship:—

	State Forests. Acres.	Other Forests. Acres.	Total Acres.
Bosnia and Herzegovina	4,753,000	2,037,000	6,790,000
Hungary - - -	3,587,000	18,833,000	22,420,000
Austria proper - -	1,679,000	22,311,000	22,990,000
Total - - -	10,019,000	43,181,000	53,200,000

Taking the three countries together, the average forest area per head of population comes to 1·6 acres. Of this ·3 of an acre is State forest and 1·3 acres private forest. The annual production of timber in these forests, of the class now exported, has been estimated at 16,000,000 tons, which is equal to 18 cubic feet per head of population, or just about the annual consumption in Germany. Taking into consideration the increase of population and the development of industries which has lately set in, the time does not seem far off when the Austrian Empire will require all the timber which her forests produce. But this is not all. Bosnia and Herzegovina, no doubt, have still considerable surplus stocks, but the forests of Hungary have been considerably over-worked. Even as regards the State forests in that part of the monarchy, the Director-General of the Forests has publicly stated that the standing crop of timber is some 30 per cent. below the normal quantity, or the amount which should be present to permit of a permanent supply like that lately taken out of the forests. The condition in the private forests is still worse, so that Hungary, at any rate, must reduce its cuttings. Again, of the forests in Austria proper, a considerable part of the area is situated above an elevation of 3,000 feet, so that their annual growth is small. Even now an agitation is going on in Austria for the imposition of an export duty on raw timber, so as to check it. More than half the quantity of timber exported goes to Germany, and the opinion has been expressed that that country will soon have to look elsewhere for sources of supply to meet the increasing demand for timber in its industries. In short, Austria-Hungary is not likely to remain an exporting country for more than a limited number of years. This means that Germany must more and more compete with Britain in the Baltic timber trade, thus not only reducing the supplies available for Britain and other countries, but also considerably raising prices.

Sweden.

	Tons.	Value.
Present annual net exports -	4,460,000 -	£7,930,000

The exports have just about doubled during the last thirty years; the average annual increase during the last ten years has been equal to 76,000 tons, or about at the rate of 2 per cent. The timber goes mostly to Britain, and next to France, Germany, Holland, Denmark, Belgium, Spain, and elsewhere. Sweden has a forest area of 48,000,000 acres, of which 12,000,000 are State forests. The latter have been taken fairly under systematic management. A considerable portion of the Swedish forests are situated far north, and their growth is very slow, giving only a small annual increment. In the more accessible areas it has already been necessary to prohibit the cutting of trees of less than eight inches in diameter at five feet from the ground, and a similar prohibition may soon become necessary in other areas. The manufacture of paper pulp and cellulose is rapidly increasing, and it is estimated that at present about 1,000,000 tons of coniferous timber are annually consumed by this industry, which is rapidly growing. Nevertheless, it is probable that the present out-turn may be maintained, and even somewhat increased, but by no means to such an extent as to make up for the prospective falling away of the exports from Norway and Austria-Hungary.

Russia, including Finland.

	Tons.	Value.
Present annual net exports	5,900,000	£.8,900 000

Thirty-five years ago the net exports amounted to about one-fourth, so that the mean annual increase comes to about 126,000 tons. About two-fifths of the exports come from Finland, and three-fifths from Russia proper. Of the timber, 38 per cent. go to Britain, 32 per cent. to Germany, and the remaining 30 per cent. to France, Belgium, Holland, and other countries.

The distribution of the forest area, according to proprietorship, appears to be as follows:—

	State Forests.	Private Forests.	Total.
	Acres.	Acres.	Acres.
Finland - -	20,000,000	30,000,000	50,000,000
Russia proper -	294,000.000	172,000,000	466,000,000
Total - -	314,000,000	202,000,000	516,000,000

The average area of forest land per head of population is just under 6 acres.

These are large areas, and at first sight it would appear that they are sufficient to supply any deficit that may appear elsewhere. In reality, however, matters are far less roseate. In the first place, the forest area includes enormous swampy tracts which produce little or no timber; then there are very extensive areas, which are thinly stocked with alder, birch, poplar, hornbeam, etc.; so that the area of really important forests is only a fraction of that given above. Moreover, it is very unevenly distributed over the empire. There are enormous tracts with no forests at all. In and about the Caucasus we find considerable forests, but the bulk of the impor-

tant areas are in the north of the empire—that is to say, in Finland, and in the adjoining provinces eastwards. It is from these parts that the coniferous timber is exported, and for all practical purposes these forests are of special interest. Unfortunately, information regarding their yield capacity in the future differs very considerably, and it is not easy to arrive at a final conclusion on the question. There can be no doubt about a few points. The population of European Russia, including Finland, is now estimated at 106,000,000, and it has, of late, been increasing very rapidly. The consumption of timber and firewood in a northern country like Russia is naturally very great; indeed, in many parts of the Empire it has been estimated at three tons per head of population. If this is so, by far the greater part of the forests is required for home consumption.

Professor Mayr, of Munich, has lately spent some time in Russia, and given us an estimate of their yield capacity. He divided the productive forests of Northern Russia into three regions—the western, the central, and eastern. The data which he has collected indicate that the growing stock in the western region is about 60 per cent. below the normal amount, that of the central region about 30 per cent., and that the eastern region is still normally stocked. This shows that, in the more accessible areas, production has not kept pace with utilisation.

On the whole I cannot find any proof that Russia will be able to keep up her present export for any length of time, not to speak of a further increase. Anyhow, there cannot be any doubt whatsoever that the rate at which the timber can be delivered on board ship must rise in the same degree as the distance of transport from the forests to the sea coast increases.

If we now sum up what has been said about European countries, it is clear that the exports from Norway have already commenced to fall off; that those of Austria-Hungary must soon follow in the same way; that Sweden may increase her exports to a moderate extent; and that Russia is at present certainly a doubtful factor. Under these circumstances the present deficiency of 2,620,000 tons is sure to increase, because the European sources of supply are not likely to meet an additional 600,000 tons required annually.

I have endeavoured to bring together the data of net exports of as many non-European countries as possible; nevertheless, the table which now follows is incomplete:

Table IX.

Showing the Imports and Exports of Non-European Countries.

Countries	Net Imports, Tons.	Net Exports, Tons.
South America	330,000	
Egypt	200,000	—
Australasia	160,000	—
Cape of Good Hope	150,000	—
Natal	50,000	—
China	50,000	—
Mauritius	20,000	—
Ceylon	10,000	—
Japan	5,000	—
West India, Mexico, New Guinea, Honduras	—	13,000
West Coast of Africa	—	28,000
India	—	55,000
United States of America	—	1,020,000
Dominion of Canada and Newfoundland	—	2,144,000
Total	975,000	3,260,000
Net Export	—	2,285,000

This table shows a surplus of exports amounting to 2,285,000 tons. Compared with the deficit of European countries (2,620,000 tons), a deficiency of 335,000 tons will be noticed. It is due to the incompleteness of Table IX., such countries as Siam, Java, Madagascar, and others not being represented. Besides, in some cases I had to estimate the tonnage from the values. Appendix II.

Dealing first with the importing countries, it may be said that South America is likely to continue its imports, which consist of light coniferous woods. Egypt has no timber of its own, and the imports are sure to rise with the further development of the country. As regards Australasia, it should be stated that New South Wales, Victoria, and South Australia have of late imported timber in considerable quantity, whereas Western Australia, Tasmania, Queensland, and New Zealand have exported, there being on the whole a balance of 160,000 tons annually against Australasia. The exports from Western Australia have quite lately considerably increased, and they are likely to increase further. At the same time these timbers are hard woods, of which a certain quantity will find a market in Europe, but they will never make up for a decrease in the light coniferous woods, apart from the fact that, up to date, it has not been possible to lay them down in European ports under £4 a ton, or about double what the coniferous woods cost us.

The imports into the Cape of Good Hope have steadily increased of late, and they are likely to increase further, owing to the political changes which have lately taken place, and the more rapid development of the mining industry, once the war has been brought to a conclusion. Natal is similarly situated.

China is a country which demands our special attention. So far her imports have been small, but she has little timber of her own, considering the extent and population of this empire, and the imports must increase in the same degree as her commerce develops. It is, perhaps, impossible to say when the great rise will commence, but all the signs of the times seem to indicate that it will be soon. Once the country has been opened to foreign commerce and industries, China will require, owing to her size, enormous quantities of timber, which will come from the western ports of North America and perhaps from Asiatic Russia.

Japan has made great efforts to introduce systematic management into her forests, but she figures in our table already with a small net import. With the rapid development of industries Japan will require more and more timber, which her own forests will not be able to furnish.

Taking the importing non-European countries together, there can be no doubt whatever that their net imports will increase as time goes on.

The exporting non-European countries are those around the Caribbean Sea, the West Coast of Africa, India, the United States of America, and Canada. The first of these export mahogany and other furniture wood, but they import so much lumber that their net exports dwindle down to 13,000 tons a year. The West Coast of Africa has exported 28,000 tons, consisting also of mahogany and other hard woods, valued at more than £9 a ton. Whether that export will continue or not it is difficult to say, but under any circumstances these timbers are so expensive that they do not affect the question here under discussion. British India sends teak and some furniture woods; more it cannot do, having, with a forest area which may be placed at 140,000,000 acres, to supply a home population of some 250,000,000 people.

There remain, then, the United States of America and Canada. Before dealing with these countries I propose to devote a few minutes to enquire whether other sources are available. The only countries which we need at all consider are Asiatic Russia, Central Africa, and South America. The first of these three is a big country; it contains extensive areas which are classed as woodlands; but a great part of the country is practically situated beyond the limit of profitable tree growth, while other extensive areas are plains without forest. Supposing, however, that there is a surplus of production for export, the cost of transport would be practically prohibitive. The outlets by water are towards the North Polar sea, involving exceedingly difficult navigation, and if transported by land towards the west, the distance would be very great. It is, however, not impossible that any surplus timber might hereafter go towards China.

Africa has a belt of wooded country along or near the west coast which furnishes us, as already stated, with a limited quantity of valuable hard woods, but from all I can learn, the great central forest will, as regards a source of timber supply for Europe, remain without much value. A brisk trade in caoutchouc has sprung up, but the timbers are not of the kind which

we require in Europe in large quantities, apart from the cost of transport to the coast. Matters are similar in South America. Vast forests are said to exist in Brazil and in parts of Argentina, but, as far as we know at present, they contain only hard woods of any commercial value, of which we have as yet a sufficient supply at lower rates nearer home. At any rate, the cost of transport and labour seems to be so high that Argentina, at any rate, prefers importing its timber from North America and the Baltic, rather than get it from her own forests. Possibly the forest wealth of South America may hereafter play a part in the supply of timber, but I believe that that time is far distant.

I now come to the most important part of my subject, namely, the position which the United States of America and Canada take in the timber supply of the world.

The United States of America.

It will be remembered that I have put down the net export of late years as equal to 1,020,000 tons. This is an estimate derived from the values. The latest return issued by the Bureau of Statistics, Treasury Department, Washington, entitled "The Lumber Trade of the United States," forms part of the papers published in connection with the recent Census. It contains the following information:—

Table X.

Imports and Exports of Wood and Manufactures of Wood compared.

Period.	Imports. Value in £.	Exports. Value in £.	Net Exports. Value in £.
1886-88 - - - -	2,662,000	4,224,000	1,562,000
1889-91 - - - -	3,520,000	5,430,000	1,910,000
1892-94 - - - -	4,077,000	5,345,000	1,268,000
1895-97 - - - -	3,928,000	6,579,000	2,651,000
1898-1900 - - -	3,264,000	8,640,000	5,376,000
Average of 15 years -	3,490,000	6,043,600	2,553,000

This table gives the value of timber and manufactures of wood. Unfortunately, separate returns for timber only are not available. It will no doubt cause surprise to see that more than half the exports were made good again by imports, chiefly from Canada. There has been a falling off in imports during the last three years, due to Customs differences between the two countries. The sudden increase in the exports during the last five or six years is said (in the Report) to be "the consequence of the high appreciation which European communities place on their timber resources, and the increased dependence on the American lumber supply." It is added that "during the last year much English and German capital has gone into American timber lands." This explanation is correct in a way, but I should express it somewhat as follows:—The timber requirements in Europe, especially in Britain, Germany, and Belgium, have so rapidly increased of late years that the European sources—that is to say, Russia, Sweden, and Austria-Hungary—can no longer meet them; hence the increased demand on America. This, more than anything else, proves to me that any increase in the exports from Russia and Sweden will be limited.

The question then arises, can the United States meet this increased demand for any length of time? I am quite sure that this will not be possible, as the following data will show:—

The total wooded area is given as 700,500,000 acres, being equal to 37 per cent. of the total area, and giving an area of nine acres per head of population. The timber standing on this immense area has been estimated, and it is given by one of the foremost authorities as equal to 3,450,000,000 tons (reckoning a ton equal to 400 feet board measure), which gives not quite 5 tons per acre all round. In France, Germany, and Austria this would be called about one-tenth of the average full stocking; hence the United States forests would, as regards their yield capacity, for the next half century be equal to about 70,000,000 acres in France, Germany, or Austria.

The lumber cut in 1890 is given as equal to 63,000,000 tons, and it was calculated that the existing stand of timber would last for about 50 years. For the year 1899 the cut is given as follows:—

Coniferous timber - - -	75,000,000 tons.
Oaks and other hard woods -	25,000,000 ,,
Total - -	100,000,000 tons.

At this rate the available stand would last only about 34 years. If during the next 10 years the annual cut increases at the same rate as in the past 10 years, it will amount to 137,000,000 tons, and the remaining stand will be consumed in about 25 years. Again, the annual production has been estimated at 75,000,000 tons, so that the present annual consumption exceeds it by 33 per cent. It is stated that besides the cuttings large quantities of timber are destroyed annually by fire and other sources of loss, so that it is altogether probable that the annual growth is considerably less than the annual destruction. This means that the United States consume annually not only the legitimate growth or increment, but also a portion of their capital, a process which must inevitably lead to bankruptcy if it is not stopped at an early date. The seriousness of the position has fortunately been recognised, and efforts are being made to introduce more conservative lumbering, and to protect the forests against the ravages by fire and grazing.

First an enlightened man here and another there drew attention to the matter. Soon numerous people took up the cry, societies were formed, which collected information and made it available for the general public. The State Governments next took steps to prevent destruction by fire, and to save certain areas from ruin by converting them into State parks, etc. The Federal Government established a Forestry Division, whose duty was in the first instance to collect information. Some 12 years ago a wealthy young American, Mr. Gifford Pinchot, came to study forestry in Germany and France, and he has been followed by half a dozen others, all of whom have made their studies under the enlightened guidance of my old friend, Sir D. Brandis. Soon after Mr. Pinchot's return to America, Mr. George Vanderbilt bought a forest estate of 100,000 acres, and put it under systematic management, first by Mr. Gifford Pinchot, and then by a distinguished young German forest officer, Dr. Schenck, with the main object of showing that forests can be worked profitably. About two years ago Dr. Schenck started a forest school in connection with Mr. Vanderbilt's estate, and last summer I had the pleasure of conducting six of his pupils through some of the most interesting Bavarian forests, these young men having come to learn how forest matters are managed in the old country. But this is only one instance. At the present moment forest faculties exist at three American universities. One of these has been endowed by the State of New York, who have assigned 30,000 acres of forest for the practical instruction of the students. The State of New York has spent £450,000, since 1897, on the purchase of forest lands, the total area so far required being 1,000,000 acres.

At another university a faculty of forestry has been endowed by Mr. Gifford Pinchot and his family, who have presented the university with the sum of £30,000 for the purpose. But over and above this, instruction in forestry is now given at about 40 other educational establishments in the States.

Last, but not least, the Federal Government has inaugurated a systematic forest policy. An area of 41,000,000 acres have, by presidential proclamation, been declared "reservations," and a staff of nine superintendents, 39 supervisors, and 350 forest rangers have been appointed. It is said that the patrolling of the reserved forests by the rangers has to a marked degree reduced the number of fires, has excluded timber trespassers, and enforced instructions regulating the subject of sheep-grazing, timber-cutting, and sales. All this is a small beginning, but it is a promising instalment, and if the Federal Government persists in its policy, great benefits for the people of the United States, the lumbering and wood-using industries will result, while the fear of a prospective timber famine, which has laid hold of the mind of many enlightened Americans, may yet be avoided. At any rate, it seems clear that the people of the United States are determined to preserve and adequately manage a sufficient area of forests for the benefit, not only of the present generation, but for their children and grandchildren. Surely these are facts worth pondering over!

THE DOMINION OF CANADA.

	Tons.
Mean annual net export of late years - - - - - - - -	2,144,000

The value of the exports during the last 30 years have been as follows:—

Table XI.

Showing the Value of the Exports of Timber from the Dominion of Canada.

Period.	Annual Export in £.				In per Cent.		
	To Britain.	To the United States.	To other Countries.	Total.	To Britain.	To the United States.	To other Countries.
1870–79 - -	2,627,000	1,481,000	428,000	4,536,000	58	33	9
1880–89 - -	2,212,000	1,876,000	389,000	4,477,000	49	42	9
1890–99 - -	2,493,000	2,427,000	327,000	5,247,000	48	46	6

Of the exports, 94 per cent. are coniferous timbers, and 6 per cent. hard woods. The increase during these 30 years, according to value, has been at the rate of about half a per cent. a year.

The price per ton has, however, risen since 1870. Taking white pine squared logs, for instance, the average prices were as follows:—

Period.	Average Price per Ton in Shillings.
1870–79 - - - - - - -	32
1880–89 - - - - - - -	47
1890–99 - - - - - - -	61

The rise in the price of other timber has been much smaller, but sufficient to show that the total quantity of timber exported is now less than it was 30 years ago.

Canada has not been able to meet the increasing demand in Europe. The above figures, moreover, show that whereas the exports to Britain have fallen, those to the United States have increased, so that practically the two countries now take equal quantities. A moderate reaction has, however, taken place during the last three years, owing to differences between Canada and the United States regarding the duty to be paid on timber. The exports are chiefly represented by raw material. On the other hand, Canada imports worked-up timber, chiefly from the United States, valued as follows:—

	£.
Period 1885–89, mean annual value - -	497,000
„ 1890–94, „ „ - -	548,000
„ 1895–99, „ „ - -	639,000

These imports have steadily risen.

It is of the highest importance to inquire into the yield capacity of the Canadian forests. The following table shows their areas:—

Table XII.

Showing the area of Forest in the Dominion of Canada.

Provinces.	Area of Woodlands in Acre.	Per-centage of Wood-lands to Total Area.	Area per Head of Popula-tion in Acres.
Prince Edward's Island	510,000	40	5
Nova Scotia - -	4,137,000	31	9
New Brunswick - -	9,450,000	53	29
Ontario - - -	65,356,000	46	31
Quebec - - -	74,573,000	51	50
Manitoba - - -	16,401,000	40	107
British Columbia -	182,755,000	75	1,885
Territories - - -	446,049,000	20	4,566
Total - - -	799,231,000	38	165

In round figures, Canada has 800,000,000 acres of land classed as forests, but it has been stated by the Chief Inspector of Timber and Forestry for Canada that only one-third of the area, or 266,000,000 acres, can be considered as timber lands, the rest being covered with small growth, of some use locally, but of little, if any, merchantable value. The area of timber lands and the quota per head of population are so great, that no failing of future supplies should be possible. Nevertheless, Mr. George Johnson, the statistician of the Dominion, gives anything but a flourishing account of the state of affairs. The white pine used to be the principal item in the exports. It has now fallen to one-fifth of the amount of 30 years ago, spruce having gradually taken its place. Of the latter species, enormous quantities are said to exist, but cutting has developed so rapidly of late, that, as regards Ontario, it is stated, "its increasing use for the manufacture of wood pulp, threatens serious inroads upon this valuable tree." The third of the most important trees, the Douglas fir, has its principal home in British Columbia; it appears in commerce as Oregon pine.

From a commercial point of view the forests of Canada must be divided into two parts: the eastern, which supplies chiefly the United States and Europe, and the western, which exports also to the United States, to Asia, Australia, and other countries. As already stated, the eastern half has not responded to the extra requirements of Europe, and I doubt whether Canada will be able to do so in the future, unless decided steps are taken at once to start thorough protection and systematic management on selected areas, or, as they may be called, reserved State forests. Mr. Johnson says:—

"A large portion of the (eastern) forests has been deviled, which means that all good trees have been cut out by the lumber men for marketable timber. The careless torch has lighted fires like the Miramichi fire, which swept with fierce energy over an area of more than three million acres, leaving blackened giant pines to be a reminder, for more than half a century, of the immense destruction there and then caused. Vast areas have suffered from fire so severely, that in many places the soil has been burned off to the very rock; and a century's disintegrating force will have to act upon the rock, before there can be soil enough created for practical uses."

Again, Mr. Edwards said, in 1893, in the Canadian Parliament:—

"It is safe to say, and I am sure that every lumberman in this house will bear me out in that statement, that ten times the amount of forest wealth has been destroyed in Canada through forest fires than has been cut by the lumbermen."

The cuttings in 1893 were estimated to amount to 40,000,000 tons, and if Mr. Edwards is right, the annual destruction would amount to 400,000,000 tons, or considerably more than the existing timber area produces. This is not a nice state of things to behold. Since then the forest question has attracted more and more attention. Measures have been taken to introduce a more economical system of lumbering and to check fires. But what can a small establishment do over such vast areas?

Appendix II.

Taking Quebec, for instance, each fire district comprised, three years ago, an area of three and a half million acres of wood lands. This is not the way to proceed if real success is to be achieved. The Governments of the several provinces must make up their minds to select and demarcate a sufficient proportion of the area as reserved State forests, and gradually bring them under complete control, and a rational and systematic management. Considering the large areas available to choose from, there should be no difficulty in permanently reserving an area of 100,000,000 acres, which would still leave 700,000,000 acres open for more or less unrestricted lumbering, extension of cultivation, etc. The annual revenue derived from the Canadian forests amounts, at least, to some £700,000. If half that sum were devoted to the above purpose, substantial progress could at once be made to secure not only the present, but an increased turn-out for any length of time, leading ultimately to a revenue tenfold, and more, the present amount, and securing a permanent supply of coniferous and other timber for the world.

As to the large stocks of timber in Columbia any surplus over home requirements will all be taken by China, when once that immense empire has entered upon an era of development.

It has been stated in official publications that more than £20,000,000 have been invested in the Canadian lumber and sawmill industry, and that some £5,000,000 are paid annually in wages. Surely these are sums not to be trifled with apart from the fact that under a proper system of forest management they would be capable of developing in the course of time to two and three times the present amounts.

So far I have hardly touched upon a very important matter, the manufacture of paper stuff, or pulp and cellulose. There is some difficulty of getting at the actual quantities of timber consumed by that industry. Those used in importing countries, like Britain, Germany, France, and Belgium, are included in the data given for those countries. As regards exporting countries it is stated that—

	Tons.
Sweden uses now annually -	1,000,000
Norway ,, ,, ,, -	1,400,000
Finland ,, ,, ,, -	200,000
Canada ,, ,, ,, about	1,200,000
Total - -	3,800,000

As regards the United States it should be stated that a portion of the pulp wood comes from Canada, but over and above this, the quantity derived from the State forests must be very great. For Maine alone the quantity is given as equal to 750,000 tons. I do not think that I shall be far out if I place the total annual consumption of pulp wood at some 7,000,000 to 8,000,000 tons.

In summing up now, it may be said that of hard woods there is as yet a large supply. If present sources of supply should fail, others, such as Central and South America and Africa, may be opened out. The rate per ton may rise, but the material will be forthcoming. It is altogether different as regards coniferous woods, the requirements of which amount to not less than 85 per cent. of the total. The only countries whence a further increase in the consumption of these woods can be obtained are Sweden, Russia, especially Finland, and Canada. As pointed out, Austria and the United States must cease to be exporting countries within a limited number of years. Sweden is likely to yield somewhat more in future, but the amount of the possible annual increase is not likely to be more than one or one and a half million tons. Great uncertainty exists as regards Russia. If her population increases, as statisticians have lately calculated, even her export of timber may cease, or at any rate be considerably reduced. Under these circumstances, the great stand-by for coniferous timber will be Canada, if the Government does not lose time in introducing a rational management of her forests.

The second part of my paper will be short. In it I propose to draw attention to a few lessons which may be learned from what I have said, as regards the British Empire as a whole, and these islands in particular. The following table shows the average annual net imports and exports of the principal parts of the Empire:—

Table XIII.

Showing the Net Imports and Exports of Timber into and from the British Empire.*

Countries.	Annual Average during the years 1890–94.		Annual Average during the years 1895–99.	
	Imports. Value in £.	Exports. Value in £.	Imports. Value in £.	Exports. Value in £.
Great Britain and Ireland -	17,595,000	—	22,190,000	—
New South Wales - -	467,000	—	311,000	—
Victoria - - - -	831,000	—	231,000	—
South Australia - - -	250,000	—	198,000	—
Ceylon - - - - -	—	22,000	21,000	—
Mauritius - - - -	41,000	—	37,000	—
Natal - - - - -	99,000	—	176,009	—
Cape of Good Hope - -	160,000	—	416,000	—
Jamaica - - - -	57,000	—	55,000	—
Barbadoes - - - -	65,000	—	33,000	—
Trinidad - - - -	41,000	—	40,000	—
British Guiana - - -	41,000	—	27,000	—
Queensland - - - -	—	11,000	—	5,000
Tasmania - - - -	—	39,000	—	29,000
Western Australia - -	—	114,000	—	77,000
New Zealand - - -	—	151,000	—	146,000
British India - - -	—	682,000	—	593,000
West Coast of Africa - -	—	22,000	—	70,000
British Honduras - - -	—	142,000	—	130,000
Dominion of Canada - -	—	4,470,000	—	4,835,000
Total - - -	19,647,000	5,653,000	23,735,000	5,885,000
Net Imports - - - -	13,994,000	—	17,850,000	—
Increase in 5 years - - - - - -			3,856,000	—
Average annual increase - - - - - -			771,000	—
Average annual increase during previous 5 years (period 1885–89 compared with period 1890–94) - -			382,000	—

* A few Colonies have been omitted for want of data.

These data are worthy of our most serious consideration. With all the forest wealth of our Colonies we import now every year timber valued at close on £18,000,000, and the sum has lately risen at the rate of £771,000 annually. Surely the time has come, or rather it came some time ago, for a more vigorous forest policy on sensible lines throughout the Empire. Let us strive to introduce systematic forest management, more particularly into Canada and Australasia. The question is, no doubt, beset by great difficulty, but where there is the will there is also a way. Above all, let the self-governing Colonies consider a little more seriously, than up to date, the magnificent example which has been set to them by India, where the preservation of the State forests has now been put on a safe basis for the everlasting benefit of the people of the country and the Indian exchequer.

But should we not begin by setting our house at home in order before we go and preach abroad? The imports into the United Kingdom in 1899 are valued at £25,000,000, and they have increased of late years at the rate of 332,000 tons, valued at £919,000 annually. I think I have said enough to show on how precarious a footing future supplies rest.

The price of timber is steadily, though slowly, rising, and 87 per cent. of the total imports consist of pine and fir timber, the sources of which are specially exposed to exhaustion. Whence are we to obtain the 9,000,000 or 10,000,000 tons of coniferous timber when the countries round the Baltic, and perhaps also Canada, have commenced to fail us? These are the timbers which form the very staff of life of our building trade, and a deficiency of supply in this direction must have the most serious effect upon the population of these islands. And all the time we have sufficient, and more, surplus land at home to produce all this timber without putting a single acre out of cultivation. There are 12,000,000 acres of waste land and 13,000,000 acres of mountain and heath land to choose from the necessary 6,000,000 or 7,000,000 acres. Surely £25,000,000 going out of the country every year, is money enough to take some trouble about. Only a few weeks ago "The Times" drew special attention to the fact that our imports greatly exceeded the exports, a circumstance which fills a good many people with misgivings. And here is an item valued at £25,000,000, which could be produced at home, going begging.

Whenever measures of extended afforestation have been urged, the reply has generally been that the British woodlands are maintained for other purposes and not for economic reasons, and that woodlands in these islands do not pay. As regards the first of these two arguments, very well, let it be so. I do not want to touch a single acre of the existing woods (though they could be so managed as to give a revenue, without interfering with shooting, etc.), let them continue to serve as game preserves and adornments of the landscape. What I do urge is the creation of *additional* woods on surplus lands to be managed on economic principles, for the production of timber and other forest produce. To make such a movement a success it is, however, necessary to dismiss once for all the idea that anybody can manage woodlands so that they may be financially successful. People must learn that successful forestry must be based on research at least as much as agriculture. At Coopers Hill we educate the forest officers required for India, and we have also trained three for Cape Colony, one for Ceylon, and one for Mauritius. But the study at Coopers Hill is so arranged as to meet the requirements of India, and the expenses connected with the course are necessarily high. The college belongs to the Government of India, which cannot be expected to provide for the education of forest experts who will either go to the Colonies or be employed in the United Kingdom.

Efforts have been made towards giving instruction in forestry at other places, as in Edinburgh; but what we require is at least one well equipped forestry faculty at a university, such equipment to include a suitable practical training ground. In addition, sylvicultural schools are wanted, where men of less pretensions may be educated to fill the posts of foresters on private estates of limited extent. I believe that landed proprietors would pick up the men trained at such schools to carry out the plans which experts have prepared for them.

The difficulty about extended afforestation in the United Kingdom lies in the fact that the waste lands available for planting are almost entirely private property, and that most of the proprietors are either unwilling or unable to invest money in an undertaking whch will commence giving a return only after the lapse of a series of years. They prefer a present small rent from shooting to an increased income from forests hereafter. Let us hope that the Government and enlightened proprietors will succeed i novercoming the difficulty. It is, indeed, easy to show that millions of acres which now yield a grazing revenue of a few pence an acre, or shooting rents of perhaps eighteenpence a year, could be made to yield a net revenue, after allowing compound interest for all outlay, of ten shillings and more, if put under forest in a sensible and economic manner. With a view to inducing owners to plant, Government might help in various ways. *Advances for the purpose might be given, to be recovered in the shape of a sinking fund; afforested lands might be exempt from taxation for a number of years, that is to say, until the first thinnings commence; in other words, forests should be taxed according to the income which they yield, and not the area which they occupy.* In other cases, as in the congested districts of Ireland, and probably also in Scotland and Wales, if not in England, surplus lands might be acquired by the State and put under forest. Under the existing land laws the Congested Districts Board of Ireland purchases estates. After settling all unoccupied parts with the tenants, considerable areas of waste land remain over, which should be converted into State forests. This is a matter which I pressed upon the Government of Ireland 15 years ago. There are at least 2,000,000 acres of such land available in Ireland, and still larger areas in Scotland, not to speak of Wales and even England. By afforestation additional labour would be required in rural districts, and help to reduce the eagerness with which the younger part of the rural population now flock into the great cities, where only too many are destined to swell the large army of the unemployed.

(xii.) Insufficiency of the World's Timber Supply. By M. Melard, Inspector of Forests, France.

[*Transactions of the Royal Scottish Arboricultural Society, Vol. XVI., Part iii.*, 1901.]

But seven countries are at present able to supply large quantities of timber, viz., Austria-Hungary, Sweden, Norway, Finland, Russia, the United States, and Canada. Of these, the available surplus of Austria-Hungary, Russia, and the United States is seriously threatened by increase of population and industrial development, and that of Norway by abuse of the axe. The three remaining sources of supply are absolutely insufficient.

Wood production, in which time is the principal factor, obeys economic laws other than those which govern industrial or agricultural production; and an increased demand for wood, instead of inducing an increased production, tempts owners to realise the capital slowly accumulated by preceding generations.

The situation is full of peril, and the need of instructing public opinion is urgent. Wherever it is not too late, the destruction of forest must be stopped, either by legislation or by persuading landowners to cut no more than the annual production of the soil. Formerly it was held that private owners could not undertake the production of timber, because of the low rate of interest returned by a capital invested in high forest. But the customary interest on stable securities has now get below 3 per cent., and it is probable that standards over coppice will yield quite as much as this, without reckoning anything for the certain rise that must take place in the price of timber.

Forests should not be over-burdened with taxes. There are in France forests taxed up to 20 and 25 per cent. of the gross revenue, yet they receive no kind of public protection, and the owners have to employ private guards. The rapid destruction of certain forests in the United States has also been attributed to the same cause, taxes amounting to 5 or 6 per cent. of the sale value of the forest.

The State ought to be very liberal to forest-owners, by exempting them from taxation, by free distribution of seeds and seedlings, and by gratuitous technical advice. It should afforest tracts of waste land—of which there are thousands or millions of acres in western or southern Europe, and of which the agricultural possibilities have come to an end. Such afforestation should not merely be in the mountains, where it is rather a work of defence against the forces of nature, but in the plains, which can grow timber that cannot be obtained in the hills.

There is not a moment to be lost. Forest produce cannot be procured at a moment's notice. A century and more is required to produce sawyer's timber, and the timber famine will begin ere fifty years are past.

Appendix II.

(xiii.) The Forestry Exhibition at Paris and Some of its Lessons. By J. S. Gamble, C.I.E., F.R.S.

[*Transactions of the Royal Scottish Arboricultural Society, Vol. XVI., Part i.*, 1901.]

The exhibits of the French section were in two portions: first, that of the Forest Department, and second, those of private individuals and forest societies. In France, the National Department of Forestry is concerned only with the management, growth, and tending of the forests, and all produce is sold standing; hence, works of conversion and extraction, which are such a feature of forest work in Germany, Austria and Hungary, were but little represented. Sylvicultural work was, however, represented by copies of forest working plans, with the control books belonging to them; there were also several interesting exhibits to show the progress made in forest roads and forest works. Timber was represented by numerous wood specimens, and a large series illustrated the small forest industries and the local uses to which the products of the forests are put. The chief State exhibits were, however, those illustrating the steps taken in recent years to reclothe denuded mountain slopes, to regulate torrents, to prevent landslips, and to plant coast sands. In the last forty years the Government has reclaimed nearly 640 square miles of country, and spent about £2,500,000. The planting of mountain sides liable to denudation is of less importance in Britain than the fixation of shifting coast sands and dunes, such as on the coast of Moray. The most important work in this connection has been on the coast of the Bay of Biscay. This was commenced in 1779, and nearly completed in 1864; an area of 260 square miles having been reclaimed and afforested, almost all of it with the pinaster, at a cost of about £620,000.

The German Government also exhibited drawings, etc., showing the work done on the coast of the North Sea; the shifting dunes on nearly the whole north coast of Germany having now been afforested with Scots pine.

The Russian exhibits included a map, showing the area of forests in the Empire to be something under 1,000,000 square miles. Except in the Caucasus, much of the southern half of Russia is bare of forest; the forest area then increasing largely, until in the north, between the parallels of St. Petersburg and Archangel, the country is almost all wooded. Much of this forest area must be very far, not only from the coast, but even from navigable waterways or railways, and thus difficult to work with profit.

The Russian forests are chiefly spruce and Scots pine, but it is interesting to note that there are in places woods of nearly pure lime, worked for bast fibre, bark, boots, boxes, baskets, etc. The preparation of working plans for the Russian forests began in 1840, and most of the Government forests in the centre and south have been placed under systematic working, while considerable progress is being made in the huge areas of the north and Siberia. Much attention is paid to the economy of refuse material, and the utilisation of the less valuable trees, such as the manufacture of tar, resin, turpentine, acetate of lime, methylated spirit, tanning extract, etc. The manufacture of resin and turpentine from the Scots pine is on some provinces so important an industry that in 1898 these products were exported to a value of about £180,000. If such energy can be displayed in the proper management of forests in regions which, like those of northern Russia, are poorly supplied with means of transport, it ought to be possible to do more in Great Britain. We have in places large areas of pine forest, often of branching trees poor in capability of yielding timber, but which might be utilised, without the need of felling, as a source of supply of resin and turpentine.

The chief lesson brought out by these collections is that forestry requires not merely a smattering, but an intimate knowledge of several sciences. In such countries as Austria, Germany, Hungary, etc., a forest officer is bound to be a first-rate scientist: and in this country it is beginning to be admitted that scientific aptitude and a liking for science are requisites of the first importance. A really successful forest officer must at every hour apply scientific methods, and a love for science, to a correct appreciation of the phenomena which he comes across. In Scotland foresters are in most cases more or less born to the work, and their powers of observation of forest phenomena are developed by experience obtained at perhaps the most impressionable age; but, valuable as is the experience so gained, it is far more so when it can be rightly guided and directed by a scientific educational training. A liking for outdoor life must rank next in importance to the development of powers of accurate observation. It is therefore to be regretted that the recommendations made recently by the British Association, urging the importance of selecting candidates of scientific aptitude, have not been adopted. In France and other European countries the students for the special forest schools are mostly selected from among the most suitable at the agricultural colleges, so that before they begin their special training they are already grounded in science. In this country, with scientific degrees conferred at the universities, more especially Cambridge and Edinburgh, very little alteration would be necessary to ensure candidates who have already a good grounding in preliminary science.

Another lesson is the development of modern methods of utilisation of forest products. The wood-pulp industry, for instance, in Sweden, Norway, and Canada is valued by M. Mélard at £8,000,000; very little is produced in the United Kingdom. The chief tree used is the spruce, grown in close plantation, and cut at a comparatively early age, when capable of giving straight pieces, free from knots and branches, of 4in. to 6in. in diameter. In 1892 there were reckoned to be about 600 factories for paper-pulp, and 200 in Austria-Hungary, producing annually about 270,000 tons of pulp.

The United States and Canadian exhibits showed that the importance of having permanent forest reserved areas, and of treating these areas in the most scientific and economical manner, is being recognised. In the United States many large reserves have already been formed and placed under working plans. In Canada Mr. J. M. Macoun states that wise laws have been made by the provincial and federal Governments, having for their object the preservation of the forests, and the various Governments are taking steps towards the re-foresting of the denuded areas under their control. It appears, however, that steps have not yet been taken to set apart permanent forests, get together a professional staff, ascertain even roughly the amount of the capital stock, and restrict fellings to the amount which can be calculated as the permanent annual yield. It is to Canada and its forests, more than to any other country, that the world will have to look when the wood famine arrives; and it may be hoped that the lesson will attract the attention of the Government of the Dominion before it is too late.

What is wanted in this country is the institution of State reserved forests and a State Department. At present the Government estates are doubtless as well and as scientifically managed as present circumstances allow; but they are badly hampered by prescriptive rights, and by the common but erroneous idea of the public that a properly managed forest is one which has lost its beauty. If the British Government wished to possess forests such as other Governments possess, it would have to purchase estates free of rights, or to plant existing waste lands.

A striking feature illustrated in the Paris Exhibition is the excellent work done by forest societies. There are on the Continent societies which not only, as in Britain, work for the dissemination of correct forest principles and the discussion of improved methods, but actually possess and manage forests of their own. The Muscovite Society in Russia, for instance, owns twenty properties, with a total area of 870 square miles, carefully worked under simple working plans. Some such society in this country, beginning by small degrees, might gradually form a forest estate managed so as to pay financially, while being worked under the best and most scientific system. In America steps are being taken towards the establishment of forest companies, to acquire and manage estates for future yield; and something similar might be done in this country. A forest company acquiring properties would, under good management, yield a small dividend for a few years at first, but would form a good investment for the future.

APPENDIX No. III. (Q. 3).

HANDED IN by Mr. SAMUEL MARGERISON.

RELATIVE MERITS OF BRITISH AND FOREIGN TIMBER.

I consider an enquiry such as the present to have long been an important want, and hope it will have results of practical importance to sylviculture in this kingdom, because great reforms are needed, and most of those "practically" interested in the subject are lacking in information as to the best methods.

Continental foresters grow much larger crops of timber on similar areas than do British. This I have seen in the forests of North Germany, and have realised from the statistics of other countries. (The virgin forests of the remoter regions also seem to have better crops.) At the same time the trees are longer, straighter, and freer from knots and other defects than ours generally are, and the resultant timber is more useful for many (but not for all) purposes, and involves less waste in conversion into its ultimate products. More attention is paid to systematic and scientific forestry than in this country, where we have scarcely any special education on the subject for the young forester, or, indeed, for any of the large but scattered number of people engaged in the timber industry, in production and conversion. This is a serious handicap to the business, and the cause of our being behind several countries in efficiency in timber growing and utilisation of forest products. I might say a great deal more on this part of the subject, but others will no doubt be giving evidence on it, and I will not at present offer more than that, from my observation as a man daily engaged among British timber, I am in accord with the main principles advocated by several writers on this subject (three of whom, at least, I am glad to see are on this Committee); and also that I am of opinion that a very large proportion of the great volume of timber now imported from other countries could, with proper education and management, be profitably grown at home.

It is scarcely possible for one man to be able to compare all kinds of timber, British and foreign. Indeed, it is common knowledge that probably no one knows the ramifications of every branch of the British timber trade alone, because different districts of the country have different industries, and the home timber trade is, broadly speaking, made up of local specialities, owing to the great comparative cost of transport. For instance, merchants engaged only in supplying the London trade have no real conception of the immense colliery timber trade of some other districts. We in the north have no large chair-wood business like that of the High Wycombe district, whilst the south country merchants cannot have any chance of supplying the large quantity of timber used for making bobbins and shuttles in the West Riding, owing to its low price in comparison to cost of delivery. These are only just a few examples to illustrate this point; so that it would have been better, in some ways, if you could have seen your way to accept more than one witness from the Timber Federation to give evidence on the subject of the comparative merits of British and foreign timber. I had hoped to be able to lay before you some statistics of actual experiments which I know have been made for commercial purposes; but, as is perhaps only natural (it requires a considerable amount of public spirit for a firm to give away the results of costly experiments, to the enlightenment of possible rivals in business), I have not been so successful in obtaining these results as I should like, and I must fall back on generalities. These generalities, however, are based on practical knowledge of the special purposes to which they refer.

Any comparison of qualities must depend on the purposes for which the timber is to be used, and on the environment or system under which it has been grown. For instance, I know of no reason why we cannot grow as large crops of as clean, long, straight timber as, say, Germany. In fact, we have occasional patches of woodland under similar cultural conditions, producing similar results. But for some purposes the wood grown in this manner is not suitable. It is all right for use where clean grain, long lengths, ease of working, low price, and lightness of weight are required, and where the greatest durability is not necessary. And, I may add, that I do not consider it as necessary, in these days of rapid changes, to make all our appliances and constructions of so permanent a nature as it used to be. Sometimes an implement or erection which has been improved upon, or might be superseded, is retained simply because it is sound and good, long after it has ceased to be profitable to use it. And so, easily worked, cheap, long, clean grained, though less durable timber, may often be the best for its purpose.

But, on the other hand, where short length, durability, weight, density, and toughness are required, the trees grown under conditions recently practised in this country will yield more suitable timber. That is, the trees grown in our more open woods and in our hedgerows are, although shorter in the bole and rougher in the top, more durable, of greater density, and greater strength than timber grown closely together, as it is in the well-managed Continental and in the primæval virgin forests.

To take a few concrete examples:—

It almost seems superfluous to compare British oak with foreign. Very few countries grow oak timber equal to our own in size, strength, wearing, and lasting qualities combined. Some imported oaks are equal to ours in size, and (speaking broadly) they are superior in ease of working and freedom from coarseness and some other defects. But this freedom from defects is largely due to selection, I believe, and, judging from what we see in our old buildings, and in occasional woods of comparatively unthinned trees, our country can grow oak equal to foreign in these respects, and superior in the special good qualities of the species. The comparative coarseness of some of our oak is due to the system under which it has for some time been grown. British oak will withstand much greater torsional or twisting strains than almost any other. Hence its preferential selection for purposes where this strain occurs. For the framework of railway waggons it is eminently suitable. One of my customers simultaneously built as an experiment six railway waggons with the framework of English and six with a framework of foreign oak, for exactly the same purposes, and they were used in that way. By the time the waggons built on English timber foundations came in for repair, he tells me, the others were quite worn out. As nearly the same labour had been expended in building the latter as the former, it was true economy to use the somewhat higher priced British than *vice versâ*.

For general wheelwright work, where the implements are often exposed to sudden strains (as in the spokes) and to long exposure to the weather, it is found that by far the most serviceable timber for construction is British and not foreign oak.

For pit props, where heavy and non-cohesive roofs occur, it is found that oak props, although priced 60 per cent. more in first cost, are cheaper than the best foreign pine and fir props, because, besides bearing a heavier crushing strain in the first place, they can be withdrawn when no longer required, and by slightly shortening them they can be used again and again in other positions. Similar commendation can be made of our native larch.*

And for building and decorative purposes in domestic and public architecture, we have in British oak æsthetic qualities possessed by no other oak, and perhaps by no other timber.

* A member of the Timber Trades Federation reports the case of a piece of land in Shropshire planted with larch in 1860, which produced a crop "realising a profit of £40 per acre." The same correspondent (Mr. Bowden, of Caswell and Bowden, Limited, Birmingham) says that where timber growing appears to be unremunerative, probably agriculture would be no less so.

Appendix III.

Other British-grown timbers, by the way, are not appreciated for their decorative effects. Home-grown acacia, yew tree, walnut, holly, and other species are capable of being used in many beautiful ways in the decoration of our homes—parquet, furniture, panelling, mouldings, &c.

For paving blocks it is found that built-up blocks of English oak, such as are produced in large quantities by one British company and its connections, are superior to most, if not all, other kinds; and this is a method of using up small pieces of what would be otherwise waste timber, which might be greatly extended. Then again, ladder staves and fence palings of British oak are superior to those of any other oak, so far as my experience goes.

To take another species:—German beech is grown in much heavier crops per acre than is our own, and no doubt it is very useful for some purposes. At the same time there are uses to which beech is put in this country, in large quantities, for which the German beech is utterly unsuitable, because of its lack of density and weight. For mallets, shuttles, spools, wheel-cogs, rollers, and similar products, it is much inferior to our own hard-grown and comparatively rough beech. Weight and resistance to repeated blows (resistance to indentation) are of more importance and value for these purposes than is the growing of large crops. A customer, a very large user, to whom I referred the question for confirmation, puts it in these words: "Such German beech as we have had was much inferior to our English beech, being light in weight, too free and open, and had not that solidity about it that ours had." I may add that we *can* grow beech of the same quality, and I think to the same extent of crop as can be grown in Germany, but it may not be the best thing to do in this country. Another disadvantage of imported beech is, that it is brought in in short lengths for stowage. Now felled beech is very rapidly attacked by rot at the transverse section ("end of grain") when cross-cut, and as our own beech can be forwarded in trees practically full length, it can be safely stored out of doors for a longer period if need be, without being attacked in this way to the same extent.

There is probably no ash quite equal to British ash, and no cheap foreign substitute takes its place. One of our members writes: "Ash timber of good quality is yearly becoming more scarce. The imports of this wood from foreign ports are increasing. Ash is a moderately quick growing timber, and would pay owners better than slow-growing wood, such as oak."—Mr. J. S. Remer (Messrs. Remer and Co., Liverpool—large users of ash).

The same gentleman also suggests that "All straight young suckers in hedgerows should be protected, so that trees 20 to 30 yards apart should be constantly taking the place of those cut down."

Where really rough wear is experienced, even British spruce is sometimes preferred to foreign, but as a rule the firs and pines generally are of a better quality in imported timber than in our own. This, nevertheless, is more a result of the system of sylviculture than of any inherent fault of our climate and soils. Take scaffold-poles, flag-poles, boat-stowers, and similar long, nearly parallel poles, for instance. The foreign spruce trees, having been grown in close proximity, have made longer annual growths, with, consequently, longer spaces between the knots, than ours do. Besides, these knots are smaller because their crowding in the plantation has destroyed the branches before they got to any size, the leaves being borne on the topmost branches only. There is also less liability to "cross-grained" timber from the same causes. The annual accretions to the tree are not laid on from youth to age in even layers from the root to the top of a 60ft. central pith, but are added, so to speak, "cone-on-cone." The longer we can get the annual cone, the less cross-grained will be the pole or tree, and at the same time the fewer the knots. So that even if we could grow the same bulk per acre, we should not get the same quality of long, clean-grained timber from our usual thinly-cropped woods.

On the whole, it would be much more profitable to grow our timber in thickly-planted woods, and in thinning, to preserve the leaf-canopy as intact as possible. This would often involve self-denial from realising, for present purposes, a capital which would pay much better if left to increase over a long period.

It costs, I take it, about 5d. to grow a cubic foot of fir timber in this country. On the average it costs at least another 5d. or 6d. to get it into the market, and it is sold (I speak from local experience) at 8d. or 9d. per cubic foot, that is, less than cost price. This selling price is ruled by the selling price of foreign fir. There is no reason why we cannot produce as cheap and good fir as other countries, but we cannot afford to sell it as cheaply (although we do so) because the cost of handling it and transporting it short distances is greater than the cost of the long distance traffic from abroad. Until some means of cheapening these handling charges is devised and adopted, the growing of cheap timber and transporting it in the round in this country will not pay, unless the "timber famine" which seems to be before us—owing to foreign supplies getting more and more remote—sends up prices. The relation of transport to value in the case of timber is of much greater proportionate importance than it is in the case of, say, corn. Where a ton of corn would cost 5 per cent. of its selling value in transport, a ton of fir timber would cost 60 per cent. A ton of spruce from the Baltic or even from Canada would not cost any more than, if as much as, a ton of spruce from the Yorkshire hills to the Yorkshire coal mines! Differential railway rates are costing timber growers as much as the rental value of much of the lands the timber is growing upon.

The fault of this is not all to be laid to the doors of the railway companies. Foreign timber imports are handled in larger quantities than ours, thus saving much cost in detail work. It is in handier forms than ours often is. Our timber is often in clumsy trees, crooked and knotty, forming comparatively light and dangerous loads per truck. But there is no indication that if any effort be made by our home producers and merchants to centralise their work, make their loads more compact, and arrange for regular and large consignments, that the railway companies would make their charges equal to those on imported timber. Straight and crooked, large lots and small, compact loads and light ones, are all charged at the same rate. There is a growing tendency to use road locomotives for moving timber in some districts, and it is said to have resulted in considerable saving where the roads are suitable. But good roads do not, as a rule, penetrate into the woods, and there are sometimes weak bridges and sharp corners to negotiate with long, heavy loads. So that this competition can only be partial. And in this country we have not the advantage of rivers and water-shoots, nor the certainty of frosts to harden swampy places, as is the lot of some timber countries.

The question of transport is perhaps the most important one for growers of timber to consider in connection with their forestry, because it is of little use to grow large and valuable crops unless there is an available market for them. At the same time, the life of a tree is a long one, and that of a forest longer, and if conditions of transport change as much for the better in the next eighty years as they have in the past eighty, there will be no fear of being able to place the crop in an advantageous market.

Special attention should be paid, in forming or renewing forests, to concentration of production, the production of timbers of the higher values where possible, compactness of loads, and regularity of supplies. By these means the relative cost of transport will be reduced.

The regulations and conditions of sale of British timber are much modified by the stringency with which they are drawn up for the protection of game. Merchants cannot give as good prices for timber when the time of removal is limited to short and inconvenient periods, as they could if they had a more extended time. And the timber has sometimes to be felled "out of season" for the same reason, and so its quality is impaired. With care and good management, the owner of extensive woodlands need have no lack of good shooting, whilst at the same time studying the convenience of his customers. But, as a rule, he is guided more by his gamekeeper than by his forester, greatly to his and his family's loss.

Hundreds of thousands of acres of what is now unproductive land could profitably be planted with timber. A few weeks ago I was valuing a large plantation of fine ash and oak, with splendidly-growing younger sections, the whole worth an average of £80 per acre, adjoining exactly similar land let as a farm (including a very good homestead, and landlord paying rates) at 7s. 6d. per acre. There are hundreds of thousands of acres of similar land, which would pay much better if planted with trees. The sporting value would be as great, and in many cases greater than it is at present. The chief reasons why more is not done in planting such

properties are, I take it, (1) not calculating the loss there is being sustained, and (2) lack of capital to carry out the work.

My opinion, and that of some other members of my federation, is in accordance with those who have advocated Government assistance by grants of money (with efficient supervision) to individuals and corporations, for the purpose of planting land which is at present comparatively unproductive. The supervision which such grants would involve, if carefully planned, would secure that systematic culture and tending of crops of timber which at present are generally absent. "Working plans" to cover a long period of time are needed in order to supersede the present disconnected and wasteful practices of timber production, whether the result of temporary necessities or lack of knowledge. This country (like others) has for a long time, in matters sylvicultural, been living on its capital instead of its income. We have consumed more than we have produced, instead of providing a larger stock to meet the demands of the ever-nearing day when foreign supplies are too remote to be imported at a price less than we could ourselves have grown them. A member of our federation (Mr. Remer) suggests that it "be compulsory for all owners of land to re-plant where the land is not converted into arable land." Appendix III.

We also require a larger and more thorough and penetrating system of education on forestal matters, not only for the young forester and owner, but also for all who are engaged in the timber industries. (I would even go so far as to suggest that a chapter or two on a few first principles of tree-growing be introduced into children's school reading-books.) And the system of technical forestry education ought to be such that, at a number of well-distributed centres throughout the kingdom, it would be possible for students to obtain sufficient scientific and practical training, and where possible, see and do actual forestry work, within easy distance of all the country districts. Many a wood is destroyed by some forest enemy, many a wood is allowed to stand after it has ceased to be profitable, and many a piece of land is allowed to lie unproductive, and many a wood is wrongly formed and tended, which would not be allowed to do so, if the true principles of sylviculture were more generally taught.

APPENDIX, No. IV. (Q. 159). Appendix IV.

HANDED IN BY MR. SAMUEL MARGERISON.

EXTRACT, RELATING TO TIMBER, FROM THE GENERAL RAILWAY CLASSIFICATION OF GOODS, 1902.

TIMBER.

1. The term "Timber" embraces all descriptions of Wood in an unmanufactured, or roughly hewn, or roughly sawn state; but (except when otherwise specifically stated) not any Wood shaped, or prepared, or partially prepared, or any description of Wood separately specified in the Classification.

2. For Square Timber the divisor of 144 is used.

3. In the measurement of Round Timber, when carried at measurement weight, the divisor of 113 is applied, measurement being taken by string under bark (or by string over bark with a reasonable allowance for the bark), except when such Timber is consigned at tape over bark rates, or it is agreed that tape over bark rates shall apply.

4. The right is reserved to require payment for the carriage of Bark upon Round Timber charged on the 113 divisor in addition to the rates charged for such Timber.

5. When Round Timber is carried at tape over bark rates the divisor of 144 is applied, measurement being taken by tape over bark.

6. Round Timber—
(i.) Between Stations on Scotch Railways.
(ii.) From Stations on Scotch Railways to Stations in England and Wales.
(iii.) From North Eastern Railway Company's Stations.
charged at measurement weight, is carried at tape over bark measurement with the divisor of 144, the rates being exclusive of loading, for which service, when performed by the Company, an additional charge is made.

7. When Debenture, Octagonal, Waney-edged, or other Timber of defective angle is measured by calliper (as Square Timber), the 144 divisor is used, but an allowance is made of 22½ per cent. When Debenture, Waney-edged, and defective angle Timber is measured by tape or string, the 144 divisor is used, but in such case the allowance as when measured by calliper is not made. Logs practically square, not to be treated as Waney-edged Timber.

8*. Baltic Sleepers and Sleeper Blocks are charged at measurement weight on the following basis :—
Sleepers 10 inch by 5 inch by 9 feet rectangular, 16 creosoted and 17 not creosoted, to be taken as equal to 1 ton.
Other dimensions *pro rata*.

9*. Lathwood (not Laths) is charged per square fathom, or 36 square feet, 9 cwts. per foot in length.

10. When Timber (other than Round Timber, and except Sleepers, which are already provided for by clause 8) chargeable at measurement weight, is creosoted, an addition of 5 per cent. is made to the weight for the creosote.

11. When ascertaining the measurement weight of Creosoted Telegraph Poles, Telephone, Ricker, and Scaffold Poles, 5 per cent. is added thereto in respect of the creosote.

12. All Timber in pieces of or over six tons measurement to be charged 25 per cent. over usual rates.

13. The weights of the various descriptions of Timber must be computed from the measurements upon the following bases :—

Acacia.	Gumwood.	Lignum Vitæ.	40 cubic feet are taken as equal to 1 ton.
Ash.	Hickory.	Mahogany.	
Baywood.	Holly.	Oak.	
Beech.	Hornbeam.	Padouk.	
Boxwood.	Ironwood.	Sabicu.	
Ebony.	Jarrah Wood.	Satin Walnut.	
Greenheart.	Karri.	Teak, or other Heavy Timber.	

* Not applicable to traffic between stations on Scotch railways.

Appendix IV.

Alder.	Fir.	Plane.	50 cubic feet are taken as equal to 1 ton.
Birch.	Hemlock.	Poplar.	
Cedar.	Kauri Pine.	Rosewood.	
Cherry.	Lancewood.	Satinwood.	
Chestnut Wood.	Larch.	Spruce.	
(Spanish and Horse).	Maple.	Sycamore.	
†Elm.	Pine.	Walnut.	
	Pitch Pine.	or other Light Timber.	

† *When elm is measured by string under bark (or by string over bark with the allowance for bark) with the 113 divisor, 40 cubic feet are taken as equal to one ton.*

14. Except as provided in clause 6, the rates for Round Timber, unless otherwise noted, include the ordinary service of loading from beneath the crane when the Company perform that service, but are exclusive of haulage to the crane when the Timber has been previously deposited at a distance therefrom. When the Company do not perform the service of loading, a rebate is allowed.

15. The rates for Round Timber do not include unloading.

16. Round Timber at measurement weight is charged at exceptional rates.

17. When Timber is consigned by measurement weight, the number of cubic feet must be declared by Senders when consigning the Timber. If at request of Senders the Company ascertain the measurement, a separate charge is made for such service.

18. For pieces of Timber weighing less than 4 tons each in weight, which on account of their length require more trucks than one for their conveyance, a minimum charge is made of 1 ton per Truck for each Truck used whether carrying part of the load or used as a Safety Waggon only.

19. Pitwood, for mining purposes, at measurement weight, is charged at tape over bark measurement, 144 divisor.

Not applicable to traffic between Stations on Scotch Railways.

(1)	(2)	(3)	(4)	(5)	(6)
The following are charged at Exceptional rates noted for Deals, Battens, and Boards, or, in the absence of Exceptional rates, at Class C. rates, in consignments of 2 tons and upwards.	The following are charged 10 per cent. OVER the Exceptional rates noted for Deals, Battens, and Boards, but not to exceed the Class C. rates, in consignments of 2 tons and upwards.	The following are charged 20 per cent. OVER the Exceptional rates noted for Deals, Battens, and Boards, or, in the absence of Exceptional rates, at 20 per cent. over the Class C. rates, in consignments of 2 tons and upwards.	The following are charged 10 per cent. LESS than the Exceptional rates noted for Deals, Battens, and Boards, or, in the absence of Exceptional rates, at 10 per cent. less than the Class C. rates, in consignments of 2 tons and upwards.	The following are charged at Class C. rates.	The following are charged at Class 1 rates in less lots than 2 tons.
Deals, Battens, and Boards unprepared (not exceeding 4 inches in thickness) of Fir and Pine other than Pensacola or other Pitch Pine Deals, Battens, and Boards — At 66 cubic feet to the ton.	Flooring Blocks (*not parquetry nor inlaid*) — Machine Weight.	Pitwood, exceeding 9 feet in length consigned direct to a Mine. — Measurement Weight.	Pitwood consigned direct to a Mine — Machine Weight.	Baywood Cedar, *in logs or sawn into planks* Cherry-Tree Wood Hickory, *unsawn* Jarrah Wood Lancewood, *unsawn* Mahogany Maple, *sawn into planks* Padouk Sabicu Walnut, *in logs or sawn into planks* — Measurement Weight.	Flooring Blocks (*not parquetry nor inlaid*) Pieces of roughly-sawn wood, in short lengths, tied in bundles, (for making packing boxes). Telegraph Pole Cross Pieces — Machine Weight.
Pensacola or other Pitch Pine Deals, Battens, and Boards unprepared, not exceeding 4 inches in thickness — At 55 cubic feet to the ton.		Telegraph, Telephone, Ricker, and Scaffold Poles (including *Creosoted*) — *see* clause 11. — Measurement Weight.			
Any of the following sawn into planks, or sawn or hewn into square or waney-edged logs :—					
Alder, Ash, Beech, Birch, Chesnut, Elm, Fir, Hemlock, Hornbeam, Larch, Oak, Pine, Pitch Pine, Plane, Poplar, Spruce, Sycamore, Teak. — Measurement Weight, as per preceding page.	Boards, Flooring, prepared, and other planed or prepared Boards (*not parquetry nor inlaid*) — Measurement Weight.			Cocus Wood Zapateria Wood Telegraph Pole Cross Pieces — Machine Weight.	Boards, Flooring, prepared, and other planed or prepared Boards (*not parquetry or inlaid*) — Measurement Weight.
Sleepers, Wood (including Creosoted)—*see* clause 8 Stavewood (not Staves) Lathwood (not Laths) — Measurement Weight.					
Posts and Rails, *Fir*, cut square for Fencing (not exceeding 4 inches in thickness) — At 66 cubic feet to the ton.	Boards, tongued and grooved—(as planed or prepared boards).				
Posts and Rails, cut square for Fencing, including Morticed Posts and Scarped Rails, but excluding Posts with butt ends, no allowance in measurements to be made for morticing or scarping, or other inequality — Measurement Weight.					
Posts cut square, with butt ends for fencing **Paving Blocks, Wood** **Pieces of roughly-sawn wood, in short lengths, tied in bundles (for making packing boxes)** — Machine Weight.					

APPENDIX, No. V. (Q. 793.)

Appendix V.

HANDED IN BY MR. ANDREW SLATER.

EXAMPLE SHOWING THE OUTCOME OF 40 ACRES OF A MIXED LARCH AND FIR WOOD AT THE END OF THE SEVENTY-FIFTH YEAR.

This wood, situated in the south of Scotland, had a north-western exposure, and rose from an elevation of about 650 to one of about 1,000 feet. The soil is of a light loam, full of stones and boulders, and rests on a whinstone formation (Greywacke), and would scarcely be worth 1s. per acre. Previous to 1884, probably, from £1,500 to £2,000 worth of wood had been extracted, but in the early part of that year 1,218 trees were blown over by the severe gale that passed across the country then. In 1886 these trees were prepared, put into lots, and sold, and realised, after deducting expenses, the sum of £277 7s. 6d., or about half what they would have brought previous to or five years or so after the storm took place. In 1892 2,208 larch and 811 spruce were cleared off, and realised a net sum of £1,433 1s. 2d. In 1893 the final portion was cleared of 4,603 larch and 1,224 spruce, etc., and realised a net sum of £1,636 12s. 6d. After deducting a sum of £10 10s. for sundry disbursements, the total net sum realised for the 40 acres was £3,336 11s. 2d.

Assuming that previous to 1884, after deducting 17 per cent. for expenses, £1,245 worth of wood had been extracted at various periods, and taking the yearly rent and other expenses as being at the rate of 2s. per acre, and the cost of formation at £3 10s., the following calculations at 3 per cent. give the financial outcome.

FINANCIAL outcome of the foregoing at 3 per cent. Compound Interest.

Age when Extracted.	Sum realised.	Years to end of rotation.	Value at end of rotation.
	£.		£. s. d.
30 years	130	45 years	491 11 10
45 „	250	30 „	606 16 –
55 „	400	20 „	722 8 3
65 „	465	10 „	624 18 3
68 „	277	7 „	340 13 1
74 „	1,433	1 „	1,475 19 9
75 „	—	—	1,636 12 6
			5,898 19 8
2s. annual rent over 75 years		£1,090 10 –	2,375 10 –
Cost of formation, at 3l. 10s. per acre		1,285 – –	
		Total £.	3,523 9 8

Which is equal to 92l. 5s. per acre, or to an additional annual rent of 6s. 2d.

APPENDIX, No. VI.

Appendix VI.

Handed in by Mr. W. B. HAVELOCK, Brocklesby.

PARTICULARS OF RECEIPTS AND EXPENDITURE OF THE FINAL CLEARANCE OF AN 18-ACRE PLANTATION, 75 TO 80 YEAR'S GROWTH IN THE NORTH RIDING OF YORKSHIRE, FELLED OFF IN 1890–91.

The timber was offered, standing, in 4 lots, by tender, and the highest offers were accepted. The timber afterwards was felled and measured by the vendor, and realised as follows:—

Timber, &c. Sold.

			£. s. d.	Per foot. s. d.
1,327 Larch	50,626 feet = 38⅛ feet	per tree,	2,666 18 8	= 1 –½ +
261 Scotch	3,480 „ = 13⅓ „	„	53 11 11	= – 3¾ +
74 Oak	891 „ = 12 „	„	33 19 9	= – 9 +
116 Beech	3,448 „ = 29¾ „	„	84 10 6	= – 5¾ +
35 Birch	431 „ = 12⅓ „	„	8 8 2	= – 4½ +
12 Sycamore	327 „ = 27¼ „	„	14 19 9	= – 11 +
120 Ash	1,690 „ = 14 „	„	84 10 –	= 1 – +
4 tons Oak bark, at 87s. 6d. per ton	=		17 10 –	
Fuel sold			17 15 6	
1,945 Trees—60,893 feet			2,982 4 3	
Less discount			73 13 5	
			2,908 10 10	
Add 1 Larch—144 feet (and 1 Scots fir, 40 feet)			8 10 –	
			2,917 – 10	
Add also timber used on the Estate:—				
359 feet Larch and Oak, at 1s.			17 19 –	
			2,934 19 10	
Deduct Expenditure as follows:—				
Actual cost of felling, harvesting oak-bark, dressing and measuring the timber		£. s. d. 92 4 2		
Advertising, showing timber, and other petty expenses, say		7 11 10		
			99 16 –	
Total Nett Receipts			£. 2,835 3 10	= £157 10s. per acre

Appendix VI.

The land was not worth more than 7s. 6d. an acre for agricultural purposes, and directly it was cleared it began to go back to heather and gorse.

Unfortunately there is no record available of the return from the thinnings, but the old woodmen used to say that several hundreds of pounds worth had been sold at different times, besides what was used on the estate.

It may be added that in measuring the larch and Scots fir, an allowance was made for bark of ¼ inch in the quarter girth on all trees girthing 8½ and under, and ½ inch on trees 8¾ inches and above. The oak was measured under bark, and the other hard woods over bark.

Assuming that plantations up to 40 years of age will yield thinnings of sufficient value to pay labour incurred in repairing fences, thinning, etc., but will do little, if anything, towards reducing the outlay originally expended; and that after 40 years of age, in addition to paying for labour, the thinnings ought at least to be of sufficient value to prevent further interest accumulating on the principal, and to pay the rent, we may estimate the annual return per acre on this plantation as follows:—

Taking the cost of planting and fencing to be £8 per acre, then £8 at 4 per cent. compound interest for 40 years equals £38 8s. To this add the rent at 7s. 6d. per acre per annum, acumulating at 4 per cent. per annum compound interest, which amounts to £35 12s.; these together make £74, which is the debt per acre on the plantation at the final fall, thus leaving a profit of £38 10s. per acre for the whole period of 80 years, or £1 0s. 10d. per acre per annum. This may be taken as an example of a successfully managed plantation.

This ground, with an acre of old gorse added (making 19 acres altogether) was replanted with trees 4ft. apart in January and February 1898; and owing to the prevalence of larch disease it was considered advisable to plant chiefly hardwood.

Particulars of Cost.

	£.	s.	d.
Value of 1,000 yds. of new 4-rail fencing, 3 ft. 6 in. high	27	10	–
Erecting the same	3	15	–
Clearing ground for planting	1	–	–
Digging 50,000 pits at 1s. 4d. per 100	33	6	8
Planting 50,000 trees	25	7	9
Value of 50,000 trees, consisting of 15,000 ash, 1½ ft. to 2 ft.; 20,000 sycamore, 1½ ft. to 2 ft; 2,000 hornbeam, 2 ft. to 3 ft.; 5,000 Scots firs, 1 ft. to 2 ft.; 2,000 spruce, 1 ft. to 2 ft.; 2,000 native larch, 1 ft. to 2 ft.; 4,000 Japanese larch, 1 ft. to 1½ ft.	67	5	–
	158	4	5
The dead trees were replaced in January and February, 1899, at a total cost for trees and labour of	16	10	–
	£. 174	14	5

Which is at the rate of 9*l*. 3*s*. 11*d*. per acre.

	£.	s.	d.
In equity, only half the cost of fencing should be charged to the plantation; the remainder should be borne by the adjoining land. Therefore, taking the total cost of planting as above	174	14	5
Deducting half cost of the fencing	15	12	6
	£. 159	1	11

Which is at the rate of 8*l*. 7*s*. 6*d*. per acre.

To prevent damage by ground game it was necessary to enclose the area on three sides with wire netting, but strictly speaking this outlay should be charged to the game account, and not to the plantation.

The cost was as follows:—

	£.	s.	d.
1,000 yds. of 4-ft. combined mesh galvanised wire netting, No. 18 gauge (33 inches of 1½ in. mesh and 15 ins. of 2½ in.), at 26s. 6d. per 100 yds.	13	5	–
1,000 yds. of No. 9 galvanised solid wire	–	18	–
9 straining and 70 driving posts	2	8	6
Erecting the above	4	–	–
	£. 20	11	6

equal to 1*l*. 1*s*. 8*d*. per acre.

Summary of Cost per acre of replanting.

	£.	s.	d.
Total outlay on preparing ground, fencing, plants, and planting, including one filling up	9	3	11
Add total cost of netting	1	1	8
	£. 10	5	7

Appendix VII.

APPENDIX No. VII.

HANDED IN by MR. W. B. HAVELOCK.

Rabbits.

The damage done by rabbits to the plantations of this country is enormous, and cannot be over-stated. No one but the forester has any idea of it. They effectually prevent that natural regeneration of the woods, which is so striking a feature in some of the North German and French forests. Even where to the casual observer there seems to be a fair crop of young trees left, if the wood is carefully examined it will be found that the ash, elm, and beech, and even young oak are more or less barked near the ground, and many of them entirely peeled round. Birch and other less valuable sorts will not be touched, but the trees that in the future should form the permanent crop are hopelessly ruined. The poor forester attempts to fill in suitable trees again and again, with the hope that they may escape the rabbits, but he loses heart in the long run, and realises his helplessness as opposed to the mighty power of the rabbit.

Wire netting is in many—and I am sorry to say in most—cases a delusion. Be it ever so efficiently erected and looked after, rabbits get in, by fair means or foul, and once in they are difficult to exterminate. Of course when the forester has power to kill the rabbits inside the netted enclosures, he has a chance to grow the trees up to the time when it is thought advisable to take down the netting. After that the wood must take its chance.

Pheasants.

The preservation of pheasants when carried to an extreme also prevents, to some extent, the natural regeneration of the woods of this country. The birds eat up all the acorns and beech mast, and I have noticed recently that they will pull up in a wholesale way the budding ash seeds in the nursery, but the damage they do is infinitesimal as compared with that done by rabbits.

Hares.

Hares also do damage by cutting off newly-planted trees, but they are not so numerous as rabbits, and trees need only be protected for two or three years against them.

Thinning.

It is my firm opinion that in this country more damage is done to woods by over-thinning than from want of thinning. In saying this I do not wish it to be understood that I think this always arises from want of knowledge on the part of the forester. In many cases he is simply told that so much money is required, or that such and such a wood must be thinned in order to furnish better cover for game. But no doubt many foresters do not know the why and wherefore of thinning, and have probably never had a chance to see other woods than those they are in charge of. Again, many owners object to clear off even ripe woods, either from sentimental reasons, or because they do not wish to alter the appearance of the landscape, or they feel themselves unable to bear the cost of replanting. If

money is urgently needed the order is given to the forester to thin heavily. The so-called "German" system of forestry is, in my humble opinion, only a going back to the "natural" way. I know that on one of the best wooded estates in England, the trees were originally planted about 3 feet apart, and as I have heard very old woodmen say, they were so close that they had to creep in to thin. The early thinnings were chiefly used for fuel at the time, and little more than dead or dying trees were taken out. And what is the result to-day? These woods contain as well-grown, lengthy, and clean timber as can be found in this country or Germany either. I have seen spruce at Killarney, and in some places in England, equal to any that I saw in 1895 in the Hartz Mountains.

Present supply of Foresters.

I am not quite certain but that at the present time there are as many competent foresters in this country as there are appointments to be filled. After all, parents consider before having a son trained up as a forester whether the emoluments attached to the employment are such as to warrant them doing so, and it must be admitted that except on some of the largest estates, the pay is not such as will attract the best men. A forester on a large estate has to know "something about everything"; from the seedling in the nursery to creosoting the full-grown tree.

Creosoting.

This suggests to me that the importance of creosoting the cheapest sorts of timber, and using it locally, is not sufficiently recognised in this country. No doubt the first cost of the plant deters many proprietors, but if they took into consideration that it costs as much per foot to remove spruce or pine worth (say) 2d. to 3d. per foot in the wood, as it does oak or ash worth 2s. or 2s. 6d. per foot, or larch 1s. 3d. per foot, surely they would see how necessary it is to keep the lowest priced wood at home. It is understood of course, and allowed by anyone with a practical knowledge of the subject, that creosoted pine or spruce will last as long as uncreosoted larch. The advantages of creosoted timber are now so universally recognised that it is not necessary for me to labour the point, but I may say that creosoted spruce posts put down eight years ago are to-day apparently as good as they were when first put down. Of course in cutting up these cheaper kinds of timber for fencing, it must not be forgotten that it is often necessary to have the posts and rails a little thicker than if cut out of better timber.

Appendix VII.

To carry out a large scheme of afforestation would create more work in many sparsely populated districts, and of such a kind that is attractive to many men. "Once a woodman always a woodman." There is something in the free and natural life of the woods that appeals to nearly every man. Certainly I have not known in my time many woodmen desert the woods for the life of the city. The need of country-bred men for the army has been demonstrated *ad nauseam* during the South African war, and one of the results of extending the area of the forests in these islands would be to increase the number of such men.

APPENDIX No. VIII. (Q. 1161.)

Appendix VIII.

HANDED IN BY MR. A. C. FORBES.

SUGGESTIONS FOR THE IMPROVEMENT OF BRITISH FORESTRY.

I. *Appointment of a Standing Committee on Forestry by the Board of Agriculture, with a Staff of Consulting Experts.*

This might be a small committee chosen from the staff of the Board of Agriculture, with the addition of such expert members as may be desirable.

The duties of this committee might be:—

(a) The answering of all inquiries respecting practical forestry and applications for advice on the same.

(b) The consideration of all applications for financial assistance made to the Board under Suggestion II., and the inspection of the woods or timber with respect to which it has been made, together with the nature of the proposed work.

(c) The inspection of land on which planting by the Government is contemplated or suggested, and the supervision of the work if undertaken. (See Suggestion III.)

(d) The appointment of sub-inspectors in each district or locality in which an improved system of wood management is desirable. These sub-inspectors might be appointed by the Standing Committee to give advice on all practical matters connected with wood management when required, by visiting the woods in their respective districts under the direction of the committee, to whom applications for such advice would be made by the proprietors. They might be selected from qualified practical foresters resident in the various districts, subject to the consent of their employers, with whom an arrangement might be made as to scale of payment and other matters.

(e) The editing of a special forestry supplement to the Journal of the Board of Agriculture.—This supplement might become a recognised official medium for the publication of all matters connected with British forestry, receive and publish approved articles and extracts, and publish translations of suitable matter from Continental and other forestry journals.

(f) The collection of data and statistics relating to British forestry and the home timber trade, and the organisation of experiments and investigations in practical forestry.—This work might have special reference to the stock and annual consumption of home timber by obtaining annual returns of all timber sold and used on estates throughout the British Isles, together with prices and other details. Experiments and investigations in practical sylviculture might be organised in conjunction with estate foresters and the results published from time to time in the supplement already referred to.

II. *Advance of Loans to Landowners by the Government*, security to be given in the form of middle-aged or nearly mature woodlands, and the loan to be expended on planting or other approved forestry work.

The principle on which these loans would be granted would be that of enabling the landowner to mortgage his growing timber at a low rate of deferred interest to the Government for the express purpose of improving and extending the woodland area of the estate. By this means he would not be called upon to sacrifice his personal interests as a life-holder for the benefit of his heirs, while the necessity or temptation to cut a crop of growing timber prematurely would be removed. In the growing crop the Government would have ample security for the amount of the loan, which would be repaid with interest when the timber became ripe, while the life-holder at the time of its repayment could recover his personal loss by effecting a fresh loan on another portion of woodland. By such a system the Government would become the mortgagee of a certain quantity of growing timber, and would, at the same time, benefit not only the woodland proprietor, but remove one of the greatest obstacles to the improvement of woods and the planting of waste land without any sacrifice of public money, although it would involve a temporary loss of interest until the period for which the first batch of loans were granted had expired.

This system of loans might be arranged in the following manner:—

(a) The provision of the amount required.—The necessary amount might be obtained by the formation of a special fund, named "The Forestry Improvement Fund," formed and maintained by a special annual grant from the Treasury to the Board of Agriculture for apportionment as required.

(b) Conditions under which a loan would be granted.—A woodland proprietor wishing to obtain a loan from this fund would have to comply with certain conditions. He would first have to specify the wood or woods he wished to offer as security for it. Such woods would have to be within a reasonable distance of maturity,

[Appendix VIII.

possess all the qualifications indicative of a sound, healthy, and growing crop, and consist of a species or number of species for which a good commercial demand exists. It would have to be inspected by the Standing Committee, and its existing and prospective value carefully judged. The committee would also inspect the planting or other work for which the loan was required, and form an opinion as to its benefit to the estate and the promotion of good forestry. Both of these features being satisfactory, the Minister of Agriculture could then grant a loan not exceeding in amount the present value of the wood on which it has been raised, the necessary deductions being made for any contingencies which might depreciate its value during the remainder of the rotation.

(c) Repayment of the Loan.—The period over which the loan might extend should not be more than 30 years or less than 15 years, and its date of repayment should coincide as near as possible with the end of the rotation of the timber crop as provisionally fixed by the committee. Between the granting of the loan and its repayment, both the management of the mature wood and the young plantations or other work undertaken should be managed and carried on according to directions given by the committee, and the latter should also have power to inspect the woods and work from time to time during the period. The proprietor would be obliged to carry out the instructions given to the best of his ability, and to give satisfactory reasons for any deviation from them.

Upon the repayment of the loan Government supervision might cease, and the owner would have full control over the mature wood, and be at liberty to fell or retain it standing as he pleased.

On entailed estates the interest of the heir or heirs-at-law would be fully safeguarded by the Government conditions, but special arrangements might be made in the event of the loan being still outstanding at the death of the borrower.

III. *Formation of State-controlled Forests in Rural Districts containing too small a proportion of Woodland.* (Land for the purpose to be acquired by purchase or rent free by an arrangement with the owners.)

The advantages derived from the afforestation of poorly-wooded districts are chiefly dependent upon the manner in which the land is already utilised, and the capability of the soil to produce timber crops. In the neighbourhood of large manufacturing centres, where the land is of fair quality and its cultivation highly developed, extensive forests would be out of the question. In thinly populated districts, with large areas of poor and almost useless land for agricultural purposes, the expediency of afforestation depends upon the ability of the soil to produce timber. The agricultural value of land alone affords a very imperfect guide as to its value for producing timber, owing to the fact that the depth of soil is more important than its quality, and the character of the subsoil may be of equal or greater importance than that of the surface soil. In agricultural districts woods have an important influence upon the welfare of the labouring classes by providing them with employment during a season of the year when most farm work is at a standstill, and thus tend to check rural depopulation. Woods have also an indirect value, due to their ability to improve the agricultural value of adjoining land, by the shelter they afford to stock, and the prevention of undue evaporation from the surface. They increase the residential value of adjoining land by improving the landscape, and by affording facilities for sport, and by giving birth to minor industries amongst village communities.

Keeping the above point in view, it appears desirable that a fair proportion of woodland should exist in every parish or district. In the neighbourhood of country mansions standing on large estates, sufficient woodland usually exists to satisfy the requirements of rural economy. But on non-residential estates, and frequently on the fringes of residential properties of large extent, the proportion of woodland is frequently very small, and it is in such districts as these that the question of afforestation deserves serious attention.

The following means might be adopted in effecting the object desired :—

(a) Selection of District Suitable for Afforestation Purposes.—This might be undertaken by the Standing Committee on Forestry, whose attention should first be directed towards exceptionally thinly populated districts, as indicated by the Census Returns. Enquiries amongst landowners in such districts would elicit information as to the approximate quantity of land available for afforestation, and their personal opinions on the matter, and willingness to co-operate with the Board of Agriculture in the event of action being taken. Should the replies received to such enquiries be favourable to Government action, the districts might be visited by the Committee and an inspection made of the land available.

(b) Selection of Land in such Districts.—The great amount of attention drawn to the question of planting waste land has led many to suppose that the whole extent of waste land in this country could be planted with advantage. Such, however, is very far from being the case. The belief that trees will grow anywhere is perhaps justified as far as their existence goes, but profitable forestry requires that trees must grow at a fair rate, and the timber be of good quality when grown. To plant large areas of unsuitable land from which there is no likelihood of a return would not only be a waste of money, but would do more than anything else towards creating opposition towards a scheme which ought to be both economic and philanthropic at the same time. Very great care and judgment would be necessary in the selection of such land as would justify, by its profitable production of timber, the arguments which advocates of afforestation have long advanced.

The class of land best adapted for the purpose is probably that comprised of deep sands and gravels, which form a poor, comparatively worthless surface soil, but which are deep and porous enough to allow trees' roots to penetrate to a depth which ensures them ample feeding ground and moisture. For the purpose in view, it would not be absolutely necessary for the land acquired to be entirely waste or unutilised. There are extensive tracts of poor arable and pasture ground which would yield a better return under timber than they do at present, and the most favourable instances of profitable forestry are probably found on such land. This would have to be taken into consideration by the Committee, and not only the quality, but the available extent, position, and boundaries of the land in question judged in relation to each other.

(c) Acquisition of the Land when Selected.—When a tract of land which fulfils the required conditions has been selected, the best means of acquiring it have to be considered. It is taken for granted, of course, that the present owner or owners are in sympathy with the object contemplated, and would be willing to lend, lease, or sell to the Government for afforestation work.

The land might be acquired rent free for a certain period by a special arrangement with the owner, at the end of which period the owner would have the option of buying the timber crop at its cost value, or of selling the land to the Government at its original value, plus the accumulated value of the ground rent during the period. In either case this arrangement would benefit both parties to the agreement. The owner who purchased the plantation would have avoided the necessity for sinking the sum required for its formation at the outset, while the Government would have been spared the payment of rent for ground which brought in nothing to the Exchequer. As security for the outlay would be the unimproved value of the land, and as security for the deferred rent charge would be the growing timber crop. The temporary loss of interest would be shared by both, that on the outlay by the Government, and that on the land by the owner.

As an alternative to the direct purchase of the crop by the owner of the land, his renting of the timber crop until the end of the rotation might be possible, the rent being fixed sufficiently high to repay the Government for the original outlay and loss of interest. By this method the timber crop would revert to the landowner or his heirs at the end of the rotation.

The leasing or direct purchase of land calls for no remarks, being simply a question of finance. A method which might be found practicable in some cases, however, is that of leasing or purchasing existing woodlands, and increasing their value by improved management, thus avoiding the temporary loss of interest peculiar to most or practically all other methods of afforestation. These might form the nuclei of Government forests, which later on might be extended by the purchase of surrounding land.

Many proprietors who are unable to work their woods profitably themselves might be induced to lease or sell them, providing they were allowed to retain the shooting rights, which often constitute their chief value in the eyes of the owner.

The active co-operation of County Councils might be obtained in work of this kind, and would tend to give any scheme decided upon the necessary amount of

decentralisation without which the necessary degree of economy would be difficult. As regards finance, for instance, the cost of management and maintenance might be borne by County Councils, the necessary amount being partly supplied out of the county rates on a basis of equitable adjustment, whereby the district especially benefited by the work would bear the increased burden it entailed. There is no reason why county forests should not be formed and maintained on the same footing as the municipal forests of other countries, and they would ultimately become a source of revenue in themselves, and at the same time increase the prosperity of the rural population, both directly and indirectly.

IV.—*Practical Demonstrations in the Woods, and Short Courses of Lectures on Sylviculture to Working Foresters and Woodmen in convenient centres.*

The educational needs of working foresters are not great as regards the science of forestry, but there is much room for improvement in their knowledge of practical sylviculture. Great losses are annually incurred by woodland proprietors through this lack of knowledge in the various details of planting, thinning, pruning, the protection of woods from ground game and injurious insects, etc. These might be avoided if the elementary principles of these operations were understood and observed by those immediately in charge of woods, but so long as the latter's knowledge is purely empirical and local, no improvement is likely to take place.

(a) Practical Demonstrations.—In the case of the older generation of men no great success would be likely to follow an attempt to reach them by means of lectures, but they might be brought to take a more intelligent interest in their work by being brought into contact with a qualified forester for a day now and again, in the course of which much valuable information might be imparted in the simple interchange of ideas, and in ordinary conversation.

Such interviews might be brought about by proprietors and agents without their object being directly stated to the men they are intended to benefit, for reasons which are obvious. A little advice given locally and according to the requirements of the case may do more good than a great deal given generally without especial application.

(b) Short Courses of Lectures.—Short courses of lectures by qualified men might be arranged in districts and centres accessible to a reasonable number of working foresters and woodmen who have an ambition to rise above the ordinary level. Such lectures should be arranged in conjunction with the woodland proprietors of the district in which they would be given, and who might give their employees the necessary facilities for attending.

The provision of a lending library of forestry works might also be of value, by giving the men attending the lectures an opportunity of extending their knowledge.

APPENDIX No. IX. (Q. 2079.)

HANDED IN BY MR. ARTHUR VERNON.

Mr. Arthur Vernon has been engaged for nearly forty years in the management of a large number of estates having beech and other woods and plantations thereon, and has been extensively concerned in planting, especially in the neighbourhood of the Chiltern Hills.

In the last-mentioned district beech woods are a valuable source of revenue, and the soil and climate especially favour their growth. Much land was denuded of timber in the middle of the last century, which is of little use for agriculture, and would be a large source of revenue if replanted.

Beech succeeds best when it is self-sown, and beech woods require special treatment for success. They should be thick enough to exclude cold winds, but must allow sufficient sunshine and air, or the young growth is much retarded. Taking a thousand acres of beech wood in the Chiltern Hills district, it is found that the net yield of the beech, if well managed, will produce about twice the revenue of the adjoining arable land. The average gross yield per acre varies from 15s. in the worst woods to over £2 per acre in the best managed woods. The price of beech in the Chiltern Hills district varies from 8d. per cubic foot to about 2s., with an average of about 1s. to 1s. 3d.

Larch firs are a valuable revenue in plantation. They cost from £6 to £10 per acre for planting and fencing, and on fairly good soil will yield from £80 to £120 per acre when cut down at maturity in from 60 to 80 years, besides the value of thinnings meanwhile. It has been found that some larch plantations have paid a profit representing a steady revenue of from £3 to £4 per acre from the time of planting to the final cutting.

It would be very desirable to encourage more extensive planting of woodlands on soils which are now practically waste or unfit for farm purposes. Landowners are naturally averse to the expenditure of capital which will produce no return for at least 20 to 30 years.

There are probably three ways in which such planting to the national and local advantage might be promoted:—

(1) By encouraging landowners to obtain loans on easy terms for approved expenditure in planting.

(2) By relieving all new plantations for, say, 25 years from the payment of rates, there being no beneficial ownership until after such period unless occupied or let for sporting purposes.

(3) By improved methods of teaching forestry and facilities for woodmen to acquire information, which, together with increased advantage of easy transit, would encourage owners and add to the value of timber culture.

APPROXIMATE VALUES OF TIMBER, 1902.

	s.	d.			
Oak under 15 feet	1	3	per cubic foot.		
„ 15 to 20 „	1	8	„	„	
„ 25 to 50 „	2	–	„	„	
„ 50 feet and upwards	2	6	„	„	and upwards.
Ash under 15 feet	1	–	„	„	
„ 15 to 25 „	1	6	„	„	
„ 25 feet and upwards	2	–	„	„	
Elm under 15 feet	–	6	„	„	
„ 15 to 25 „	–	9	„	„	
„ 25 feet and upwards	1	–	„	„	
Beech under 15 feet	–	9	„	„	
„ 15 to 25 „	1	–	„	„	
„ 25 feet and upwards	1	6	„	„	
Larch Fir	9*d.* to	1	2	„	„
Scotch Fir	6*d.* to	–	9	„	„
Spruce Fir	4*d.* to	–	6	„	„
Spanish Chestnut	1	6	„	„	and upwards
Horse „	1	–	„	„	„
Walnut	2	–	„	„	„
Lime	1	6	„	„	„
Hornbeam	2	–	„	„	„
Sycamore	1	6	„	„	„
Willow	1	3	„	„	„

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Plane	1	–	per cubic foot and upwards.
Poplar, Italian (black)	–	10	" " "
" Lombardy	–	3	" " "
Birch	1	–	" " "
Maple	–	9	" " "
Cherry	–	9	" " "
Acacia	1	–	" " "
Box	2	6	" " "
Holly	2	–	" " "

MALLARDS COURT TIMBER, STOKENCHURCH.

Date.	Sale Amount. £.	s.	d.	Average Price per Load of 25 feet. s.	d.
December 1889	266	3	5	23	–
" 1890	398	19	2	31	–
January 1892	168	12	6	24	9
December 1892	220	16	7	24	6
November 1893	156	9	10	16	6
December 1894	136	17	1	19	3
" 1895	143	7	8	20	3
" 1896	201	17	3	25	6
" 1897	182	13	2	25	–
" 1898	145	3	11	22	6
" 1899	158	6	3	20	6
" 1900	238	18	9	26	6
" 1901	100	5	5	19	3
	13)2,518	11	–	13)298	6
Average per annum £.	193	14	8	23	–

Showing an average return of 2*l.* 0*s.* 9*d.* per acre per annum from 95 acres.

KING'S WOOD TIMBER, HIGH WYCOMBE.

Date.	Sale Amount. £.	s.	d.	Average Price per Load of 25 feet. s.	d.
December 1882	517	10	3	22	6
" 1883	297	12	9	19	–
" 1884	336	19	2	23	–
" 1885	269	4	–	28	–
" 1886	232	17	–	18	6
" 1887	131	2	10	19	–
November 1888	116	4	3	19	3
February 1891	296	12	–	31	9
December 1892	198	9	4	27	–
" 1894	183	6	3	12	9
November 1897	486	3	11	22	9
January 1900	121	14	3	20	–
December 1900	164	13	2	21	6
" 1901	126	18	2	22	–
	20)3,479	7	4	14)307	–
Average per annum £.	173	19	4	22	–

The area of the woodlands on the estate is as follows:—

	a.	r.	p.
Plantations in Wycombe and Penn	71	0	29
King's Wood and Common Land	188	1	2
Gomms Wood	11	2	5
Little Gomms Wood	3	1	14
	274	1	10
Deduct for Common	18	3	30
	255	1	20

Showing an average return of 13*s.* 7*d.* per acre per annum; or, deducting the plantations and some waste land, about 1*l.* per acre per annum.

Appendix IX.

QUEEN'S WOOD TIMBER, WATLINGTON.

Date.	Sale. £. s. d.		Average Price per Load of 25 feet. s. d.
February 1883	485 7 9		19 6
„ 1884	328 16 8		19 3
„ 1885	323 11 7		16 6
„ 1886	192 14 6		12 6
„ 1887	187 16 –		13 9
December 1888	192 10 10		10 3
„ 1889	306 1 3		18 6
„ 1890	390 6 –		26 6
„ 1891	200 18 11		16 3
March 1893	346 13 8	mostly Oak	14 –
January 1894	650 12 5		16 6
„ 1895	136 4 2		16 6
„ 1896	405 12 5		21 6
December 1896	366 16 7		21 9
January 1898	165 14 5		15 3
„ 1899	130 4 10		18 –
February 1900	179 12 8		16 –
„ 1901	266 – 6		18 –
„ 1902	186 7 9		18 3
	20)5,402 2 11		19)326 9
	270 2 2		Average price 17 3 per load.

Or an average of 1*l.* 7*s.* per acre per annum from 200 acres.

STUDDRIDGE TIMBER, STOKENCHURCH.

Date.	Sale. £. s. d.		Average Price per Load of 25 feet. s. d.
December 1882	493 18 9		32 –
„ 1883	403 12 9		26 6
May 1884	355 13 11	Oak and Larch.	—
December 1884	355 15 –		26 –
„ 1885	346 16 10		21 6
April 1886	511 6 9	Larch	—
January 1887	252 8 5		20 6
December 1887	161 – 8		13 9
„ 1888	258 19 11		18 6
„ „	685 3 10	Larch	—
„ 1889	606 17 4		—
„ 1890	174 13 9	mostly Ash	28 –
January 1892	219 18 8		27 –
December 1892	379 19 10		34 3
November 1893	308 17 8	Larch.	—
December 1894	215 2 1		23
„ 1895	244 18 8		22 9
„ 1896	389 19 5		27 6
„ 1897	495 15 11		24 –
„ 1898	204 15 11		29 –
„ 1899	321 5 7		27 9
„ 1900	221 19 7		30 3
„ 1901	120 14 2		18 3
	20)7,729 15 5		18)450 6
Average per Annum	386 9 9		25 –

Showing an average return of 2*l.* 0*s.* 0*d.* per acre per annum from 193 acres.

Appendix IX.

HUGHENDEN ESTATE, HIGH WYCOMBE.

Date.	Amount of Sales.	Average Price per Load of 25 feet.
	£. s. d.	s. d.
November 1882	559 16 –	30 9
„ 1883	675 19 5	37 6
December 1884	504 18 8	33 6
„ 1885	397 15 10	35 6
„ 1886	288 3 1	24 6
„ 1887	234 13 6	24 6
November 1888	380 10 6	24 3
December 1889	348 11 –	37 3
„ 1890	482 2 2	45 –
„ 1893	576 12 8	28 –
January 1895	374 3 2	27 –
„ 1897	351 1 2	28 6
February 1898	1,429 13 1	26 3
March 1900	865 4 8	31 3
„ 1901	489 19 4	27 3
	20/7,959 4 3	
Average per annum	397 19 2	

Showing an average return of 2*l.* 1*s.* 10*d.* per acre per annum from 191 acres.

Appendix X.

APPENDIX, No. X. (Q. 2540).

HANDED IN by Mr. DUDLEY W. DRUMMOND.

I have for 14 years been managing landed property in the counties of Carmarthen and Cardigan, and am at present agent for the following estates:—

	Total Area.	Woodland Area.
Cawdor	62,096 acres	2,100 acres.
Edwinsford	10,700 „	695 „
Derllys	3,162 „	75 „
Glandenys	5,000 „	83 „
	80,958 acres	2,953 acres.

comprised in 48 parishes in the above counties.

Although I have had opportunities of observing the system of sylviculture in many parts of England and Scotland, and to some extent on the Continent, my evidence will deal more particularly with that prevailing in South Wales, and notably in Carmarthenshire.

The elevation of the lands under my management range from the sea level to the upland pastures of some 1,500 feet, and the geological formations are those of the coal measures, carboniferous limestone, and old red sandstone on the east of the county, and the lower Llandovery Rocks, and argillaceous shales, and conglomerate beds on the west.

The rainfall varies from 35 to 50 inches. The agricultural rents range from 15s. to 25s. on the low ground farms, 10s. to 15s. on the upland, and 3s. to 5s. on the hill farms.

The principal plantations in Wales consist, among the soft woods, of larch, Scots pine, and spruce, and among the hard woods of oak, elm, ash, beech, alder, and sycamore, which form the older mixed woods. Practically no hard woods are ever planted now, which is a matter of much regret, and larch occupies by far the greatest area of woodland, owing to its early maturity for the pit-wood market, where it finds a ready sale in the extensive and progressive colliery undertakings in the east of the county, and thence in that direction to the Glamorganshire coalfield.

The average value per cubic foot obtainable on the ground is as follows:—Oak, 8d. to 1s.; ash, 8d. to 1s.; beech, 5d.; sycamore, 6d.; spruce, 5d.; larch, 9d.; elm, 8d.; alder, 7d.; Scotch pine, 6d.; and the felling prices average from 1s. 3d. to 1s. 6d. per ton of 40, and the haulage from 1s. 3d. to 1s. 6d. per ton, per mile, according to the nature of the roads.

The principal outside markets for timber trees are the industrial midland districts, Wigan, Darlaston, Manchester, while the pitwood is mostly disposed of locally. In this, as in all branches of the timber trade, the home produce suffers severely from foreign competition. The local collieries are very largely supplied with French and Swedish pit-wood, there having been as much as 4,500 tons imported into the small port of Llanelly alone last year.

The railway rates on timber are very high, ranging from 5s. 7d. to 12s. 2d. within the county confines, and equalling the shipping, insurance and dock rates combined from the Baltic ports, and exceeding them considerably to the midland districts.

The poor rates in the county vary from 3s. to 5s. in the £, and when to these are added the Income Tax Schedules A and B, Land Tax, Tithes, Estate Duty, and extraordinary traffic charge, a further discouragement is thrown upon planters.

The lands under wood are rated on the average at 10s. per acre for parks, 7s. 6d. per acre for low grounds, 5s. per acre for highlands, and the collective rates and taxes must be between 7s. and 8s. in the £. Further, to cap the difficulties from which we suffer are the continuing high price, scarcity and poor quality of the labour obtainable, and it is thus not surprising that the percentage area of our woodlands is so small and their general maintenance so defective.

In Wales in particular there is great mismanagement and an enormous unproductive area, which could profitably be planted and largely increase the value of its resources, and greatly improve the surrounding lands by shelter, and I should like to see a large afforestation scheme carried out on the Continental system, as there is something very incongruous in the appearance of the bare mountain sides of Wales, in the vicinity of collieries and ports where thousands of tons of pit-wood are annually imported.

With the increasing shortage of available timber at home and abroad owing to constant felling and inadequate replanting, the distant future prospect of forestry is anything but hopeful, but those proprietors who have growing plantations in hand and have the energy and foresight and means to extend their wood-

land areas, will, I am confident, reap increasing values and good returns in the future.

The future successful prospects depend entirely on the early recognition by public and private proprietors of the importance, for their own country's sake, of extending and conserving their woodlands, and public means should be adopted to impress this upon them.

As I have previously stated, larch and fast growing conifers are the order of the day, and there is very little intelligence shown as to the selection of trees for particular situations, and a lamentable mismanagement generally in their subsequent treatment.

Early return in this and all other products of land culture is only considered, and thus the replanting of hard woods is almost entirely unknown.

It is only the largest estates that possess any apology for a system or even a forest staff, and most of the woods that are felled are left to nature to restore. On the Earl of Cawdor's Estate I am enabled to do a good deal, as there exist a systematic staff, and a four acre nursery garden, from which some 90,000 forest trees are issued annually. I quickly replant the felling areas, and extend them whenever opportunities arise.

There is, however, no systematic working plan such as is prevalent in the Continental forest departments, as, owing to the small and very scattered nature of the plantations many difficulties to such course would arise.

The planting on this estate is done entirely by our own staff, and with excellent trees grown in our own nursery, from seed in some instances collected from our own plantations, and in others purchased from Scottish firms. The smaller estates generally purchase plants from the well known seedsmen, and they are planted, as a rule, by very incapable hands. Occasionally there are to be found small local nurserymen who raise and plant trees by contract, and the rates vary from £3 to £5 per acre, according to the quality of the trees and nature of the ground.

Were the Board of Agriculture to publish an elementary handbook on forestry and issue leaflets, calling attention to the great importance of planting and the principles and methods which underlie the planting of various classes of timber trees, I believe much good would ensue. The present publications are too lengthy, abstruse, and scientific, for any but learned experts to follow.

The Land Improvement Company could also bring home by similar methods to proprietors the urgency of the subject, and advertise more fully their loan systems.

Adequate training of foresters and woodmen is another necessity.

It being a national question, the Government should either remit the rates and taxes of woodlands until such time, at any rate, as a profit is shown upon them, or give a bounty to encourage the promotion of afforestation.

Much might be done also by co-operation among proprietors with the object of getting into new markets a readier means of conversion of timber and its waste products, which are not lost sight of abroad.

In 1900, 9,899,686 loads (value £25,873,564), and in 1901, 9,193,934 loads (value £22,501,010) of timber, were imported into the United Kingdom, which shows the enormous demand that exists in, and loss of money to, our country. The imports have steadily risen in amount and value during the past five years, and exceed £10,000,000 worth increase during that period. Appendix X.

That timber still does pay when properly grown, and is likely to further do so in the future, I have no doubt; but the great risks that attend it, and the long period before any dividend on the initial outlay is obtained, the uncertainty of modern legislation, and the present uncontrolled expenditure by local authorities which falls upon the land, all militate against its success.

Few dependable profit and loss accounts on individual woodlands are kept in England, and the many I have seen I have always considered somewhat illusory; but that it is a paying crop now, and likely, under advanced treatment, to be still more so, I have little doubt, and I have long held that many Welsh farms, at any rate, would be more profitable to a proprietor under wood than agriculture.

People who practice forestry, so far as my experience goes, seem to have less technical knowledge of their subject than those engaged in any other profession, and at least an elementary training is much needed. As to its details, I rather question the advisability of forming a separate State School of Forestry—the area of our national woodlands (3,034,611 acres) hardly seeming to justify this, and the difficulty that obtains in locating it in a district giving facilities for practical experiments and teaching which would be applicable to the various conditions of forestry in these isles. I believe better results could be obtained by giving special and distinct education at some of the existing agricultural colleges or local universities, such as Cirencester, within access of the Forest of Dean, where a regular and apparently very successful forestry system has been adopted; Downton, near the New Forest, where perhaps a similar condition of things may be adopted, and where, at any rate, there is a good field for practical demonstration, and similar centres in Scotland and Ireland.

The Government should be asked to subsidise these centres upon the basis of results obtained under their own examinations.

A long course of, say, 18 months might be adopted, as well as short courses of three months, with an examination at the end of each, and the subjects might be divided thus:—

1st Month.	2nd Month.	3rd Month.
Elementary. Geology. Botany. Entomology.	Surveying Mensuration. Book-keeping.	Sylviculture. Formation of Woods and Practical work.

These should be somewhat on the lines of the Army technical short courses which are so successful. Facilities should also be given for visits of inspection to Continental forests.

The long courses could be taken up by young men making the subject a profession, while the shorter courses, especially if taken by months at a time, would be available to the greater number of men in practice in various professions connected with the land, and be, I believe, a source of great benefit to the future of forestry.

APPENDIX No. XI. (Q. 2683). Appendix XI.

HANDED IN by Mr. ALEXANDER PITCAITHLEY.

In the absence of any method in the management of the woods on most of the estates of Scotland, and to my knowledge some parts of England, it is practically impossible to give a perfectly accurate result of the growing of timber, I am not aware of any existing wood where a correct record of the outlay in forming and tending, afterwards giving the value of thinnings, etc., until cleared, has been kept.

There is abundant evidence, however, to prove that timber growing, even in the imperfect way it has been done, especially during the past century, has given in many cases a handsome profit. It is at the same time evident that with a proper sylvicultural knowledge in those who had the selection of the crop for certain particular soils and situations, and for the future management of the woods, the ultimate profits would have been considerably greater. I may be allowed to quote two cases from this estate (Scone). The first is an average case of mixed forest of larch, spruce, and Scots fir, ninety years of age, of which an area of some ten acres was cut last year, and realised £1,269, as it stood after quite one-fourth of the crop had been removed in thinings, and cut out for fencing purposes, etc. It may be assumed that after deducting price of planting, upkeep

Appendix XI.

and interest on outlay it left about 25s. per acre per annum. The larch it contained was what principally enhanced its value. Upon other portions of Scone estate there are larch woods of much greater value per acre, but owing to the spread of the larch disease rendering the growing of larch unremunerative I will not refer to these.

The other case I would quote was a section of wood 110 years of age, containing 960 Scots firs and 40 larch, which was sold as it stood for almost £1,500, or at the rate of about 30s. per tree, the average distance apart of these, where the plantation was entire, being about 16 feet, the area occupied by trees being approximately about six acres, giving a result of £2 10s. per acre per annum, and this on ground worth only a few shillings per acre as grazing. These results, instead of being unfortunately the exception, might have been, with a better knowledge of forestry, vastly improved.

With very few exceptions all over the country, one finds a very different picture—gappy woods, stunted growth, short course stems standing far apart, which, when cut down and cleared away, prove "defunct debtors."

It is undeniable that there has been and yet exists a general ignorance in the profitable growing of timber crops, even in such fundamental points as the following. To what extent draining is necessary for the varieties proposed to be planted, what species to grow on various soils, etc., whether to plant pure or mixed—if pure, what variety and how close to plant; if mixed, what varieties and what proportions of varieties, when and how often to thin, and when to realise the crop. It often occurs also that when the owner wishes to sell his mature timber he runs a risk of not getting its full value, as comparatively few foresters are reliable in the valuing of standing timber, and it not unfrequently happens that only half the value is offered for a lot by a timber merchant. There are also the questions of underplanting, wind screens, diseases, and pests of forest trees, that can only be demonstrated in the forest, and which foresters hitherto have had little if any chance of acquiring a knowledge of. We now possess some proof of how pine or spruce should be grown, and also some proof that Continental principles are quite applicable to this country. We have an object lesson in the old Scots fir on Scone estate which are 120 years of age, they were grown dense until they attained their full height, and now contain over 100 cubic feet of timber each, many of the trees having a clear stem of over 60 feet. It is questionable if better fir can be seen in Europe—and this is mainly if not entirely due to what was considered the *neglect* of the plantations. While we may be said to generally accept the Continental system in growing coniferous woods, it is not so certain how best to treat hard woods, or indeed if hard woods can be grown to profit in most parts of Scotland, also how the planter is to discriminate between the suitability of a certain area for hard woods or coniferous planting.

The foregoing are only a few of the points that we foresters have all along felt our lack of knowledge of, and made us unable to confidently advise or carry out work with credit to ourselves and profit to our employers and the country generally.

While this want of forestry education may be considered the principal cause of the unpopularity and comparatively unprofitable state of forestry in this country, it must be admitted that there are other causes, such as the over-thinning of young plantations, and cutting down immature woods when a good price was offered for prop wood, or when it was considered necessary to get some income from the plantations, by which heavy thinnings the remaining crop was reduced to a condition that would permanently make it unprofitable, though the acreage remained the same.

Another and more generally important factor against forestry is the game question, especially roedeer, hares, and rabbits. If the system of forming warrens was adopted it might be to the benefit of both the forest and game departments, otherwise the only effectual remedy is wire and wire netting, which often doubles the expense of formation of plantations.

A fair estimate of the expense of planting might be as follows, per acre on ordinary hill ground without draining, using two years, one year Scots fir (which is the best size), placed 3½ feet apart, plants and planting £2 10s., or, if carriage is heavy, £2 15s.; wire netting and fencing will come to as much, except the area be on easily fenced ground, and almost square in shape; draining may be anything, according to the nature of the ground, and it is an undecided point the limit at which draining will pay.

To teach forestry effectually it is essential that a State forest be provided, where instruction and illustration would be provided of the best methods of raising timber crops under our conditions of soil and climate, and to act as an object lesson in sylviculture and systematic management to proprietors and foresters throughout the country, without which there is no chance of settling the disputes and dissensions about the application of Continental principles to this country, and no model to which foresters can shape their management, and no other way whereby experiments could be carried out with the continuity that is necessary.

Under good management it can scarcely be denied that land drawing less than, say, 10s. per acre for grazing purposes, would give a far better account of itself under wood, and land of this value would suit as a forest area, provided it was near a railway or sea coast, or both.

It must be borne in mind, however, that over the most of the Highlands of Scotland at least, the sporting value of heath land exceeds largely its grazing value, sometimes as much as six times, and where the sporting value is three or four times more than its grazing value, it would not pay to plant; but, as a general rule, where the sporting value is small and the grazing value moderate it would certainly pay. The necessity of improving our system is obvious when we see the foreigner supplying our markets with a better article than we have hitherto been producing; while, under our system, we have produced an article of inferior quality that can only be used for certain purposes as a third or fourth rate timber, when under other treatment it might excel any foreign timber, and certainly could be produced in greater bulk on less ground than that on which we grow our inferior timber.

Appendix XII.

APPENDIX No. XII. (Q. 2832)

HANDED IN by Mr. J. MAXWELL.

RATING OF WOODLANDS IN SCOTLAND.

There are two distinct and separate steps in connection with assessment to local taxation in Scotland: (1) the valuation of the subjects, and (2) the imposing and levying of the rates. These steps will be considered separately.

17 & 18 Vict c. 91, sec. 6 & 42. Allan v. Dunlop, 9 Oct. 1858, 20 D. 1354. Lord Forbes, 26 Nov. 1861, 24 D. 1458. 49 Vict. c. 15, sec. 6

1. Valuation.

Woodlands are valued upon the rent at which, in their natural state as pasture or grazing lands, they may reasonably be expected to let from year to year. Where the woodlands have also a shooting value, such value is fixed separate from, and in addition to, the value as "pasture or grazing lands."

Prior to 1886, shootings and deer forests were only valued when actually let, but in that year this proviso in their favour was repealed, and these subjects are now valued even when not let. 17 & 18 Vict. c. 91, sec. 42. 49 Vict. c. 15, sec. 4.

The value of lands and heritages is assessed by the assessor, who may call for written statements of rent from the proprietor or tenant or occupier, and, where a subject is not let, may value it at such rent as he may deem to be the yearly rent or value. The assessor prepares the valuation roll on or before 15th August in each year. On 8th September the roll is transmitted to the county clerk or town clerk, as the case may be, and is thereafter open for the inspection of any person interested. Any appeal or complaint against an asses- 17 & 18 Vict. c. 91, sec. 7. 17 & 18 Vict. c. 91, sec. 4. 17 & 18 Vict. c. sec. 11. 42 & 43 Vict. c.

sor's valuation may be made in the first instance to the Valuation Appeal Committee in counties or to the magistrates or a committee appointed by them in burghs not later than 10th September. The Appeal Court is held between 10th and 15th September, and the appeals and complaints must be disposed of by 30th September, the roll being altered in accordance with the decisions of the Court. An appeal from this first Court may be taken on a stated case to two Judges of the Court of Session, sitting as a Lands Valuation Appeal Court, whose decision is final.

In all the counties of Scotland, except nine, the assessor is an officer of Inland Revenue. It frequently happens also that the assessor in burghs is an officer of Inland Revenue.

Woodlands, where they have a shooting value, are entered in the valuation roll (1) at their grazing value, and (2) at their shooting value.

2. Imposition of Local Rates.

Rates are imposed and levied by three different authorities * in Scotland: (1) Parish authorities, (2) county authorities, and (3) burgh authorities.

(1) Parish Authorities.

Parish rates are levied upon an annual value, being the gross value as appearing in the valuation roll under deduction of the probable annual average cost of repairs, insurance, and other expenses, if any, necessary to maintain such lands and heritages in their actual state, and all rates, taxes, and public charges payable in respect of the same. These deductions are fixed arbitrarily by Parish Councils—10 per cent. possibly being given off land, 20 per cent. off houses, and 33 per cent., or even more, off railways. The deductions, however, vary considerably in different parishes. Sometimes in rural parishes or in town parishes it is the practice of Parish Councils to give uniform deductions; and there are cases in which no deductions at all are allowed, the rates being imposed upon the gross rental.

A unique feature in rating is the classification of subjects for occupants' rating. Power was given to make such classifications under the Poor Law Act of 1845, and when assessment according to means and substance was abolished by the Baxter Act of 1861 a classification approved by the Board of Supervision was made compulsory in the twenty-two parishes affected. Classification has been described as "a rough method of adjusting the assessment to the taxable capacity of the ratepayer." Under the system of classification, the main object secured was the adjusting of the burden upon subjects of trade, such as shops, quarries, manufactories, and farms. Thus, shops and manufactories might be rated at one-half, and lands at one-third or one-fourth of the rate upon houses. Under the Agricultural Rates, etc., Act, 1896, no classifications other than those certified under the Act have any force or effect, and a classification is not certified by the Secretary for Scotland unless the rates leviable on the occupiers of agricultural lands and heritages in pursuance of the classification are less than, or as nearly as may be the same as, the rates which would without classification be leviable on such occupiers in terms of the Act. The power of parishes now to classify is suspended, but a certified classification may be abandoned by a Parish Council. Appendix XII.

There are 875 parishes in Scotland; in 76 a classification is at present in force. Of these, 18 specially provide for the assessing of woodlands or shootings. In 16, woodlands or shootings are more favourably treated than if no classification existed, and in the remaining two they are less favourably treated. It would appear that, of the 58 parishes having a classification in which special provision is not made for woodlands or shootings, 35 are treated more favourably than if not classified, and the remaining 23 are less favourably treated.

Seven hundred and ninety-nine parishes † have no classification of occupants, but agricultural subjects are rated upon three-eighths only of the annual value. Woodlands are expressly excluded from the term "agricultural lands and heritages," and are therefore rated upon the full annual value. 59 & 60 Vict. c. 37, sec. 1.

All parish rates are levied in the same manner as the poor rate, equally upon owner and occupier—*i.e.*, one-half of the amount required is, as nearly as may be, collected from owners, and the other half, under deduction of the amount received from the Agricultural Rates Grant, is collected from occupiers.

The rate per £ falling upon owners is not infrequently different from that falling upon occupiers, the variation being due chiefly to the fact that the Agricultural Rates Grant being a fixed sum, will, in the case of an increasing rate, be insufficient to meet the five-eighths' relief to agricultural occupiers, and, in the case of a decreasing rate, may be more than sufficient to cover that relief.

(2) County Authorities.

County rates are levied upon the gross rental as appearing in the valuation roll, agricultural subjects being rated upon three-eighths of that rental. Woodlands are rated upon the gross rental. With regard to the incidence of the county rates, an average of ten years' rates was taken for those rates which, prior to 1889, had been imposed wholly upon owners, and that average now forms a stereotyped rate, which is paid wholly by owners. Any rate required over and above that average rate is imposed equally on owners and occupiers. The rates which are thus stereotyped in whole or in part are: the county general assessment, the county police rate, the Sheriff Court Houses rate, the lunatic asylums rate, the registration of voters rate, the Militia storehouses rate. The other rates, viz., the public health and special water and drainage district rates, special lighting and scavenging district rates, diseases of animals rate, housing of the working classes rate, road rate (excepting old road debt, which is wholly on owners), county general purposes rate, allotments rate, and light railways rate, and valuation of lands rate (where separately levied and assessed by the county) are imposed one-half on owners and one-half on occupiers, but, unlike the parish rates, it is one-half of the rate per £ which is imposed on owners and occupiers respectively. 52 & 53 Vict. c. 50 sec. 27 (4). Govan Police Comrs. v. Armour, 3 Feb. 1887, 14 R. 461.

(3) Burgh Authorities.

Burgh rates are levied on the gross rental as appearing in the valuation roll, certain subjects, including woodlands, being rated on one-fourth of the gross rental. 55 & 56 Vict. c. 55, sec. 340. 55 & 56 Vict. c. 55, sec. 347.

APPENDIX No. XIII. (Q. 2887).

HANDED IN by Major P. G. CRAIGIE.

(A).—NOTE ON THE BOARD OF AGRICULTURE'S POWERS WITH REFERENCE TO LOANS FOR PLANTING.

Loans for planting under the Improvement of Land Acts may, at the present time, be charged on estates, under like conditions as regards inspection and sanction by the Board of Agriculture to those for other works of improvement. These charges are subject to the maximum period of 40 years. This maximum has only been permitted since the passing of the Improvement of Land Act, 1899, which enlarged the limit of 25 years formerly enforced by statute, but charges "in respect of the planting of woods or trees" created either before or after the passing of the Act of 1899 for less periods than 40 years, may, on the application of the

* Certain ecclesiastical rates are imposed by heritors; and District Fishery Boards also rate the subjects within the Fishery Board areas, but these rates are unimportant, and are not dealt with.

† In five of these parishes no rate is levied for relief of the poor, the funds being provided otherwise.

Appendix XIII.

landowner, not sooner than 7, nor later than 10 years from the date of the absolute order creating the charge, and, with the consent of the persons entitled to the charge, be extended at the discretion of the Board to the maximum of 40 years.

Planting was not one of the earliest objects contemplated by the series of Acts regulating charges for land improvements. The original grants of public money applicable to improvements were limited to drainage works under the Public Money Drainage Acts, 1846-1856; but in the subsequent Private Money, or "Companies" Acts, "planting for shelter to the extent of one-half of the outlay for such planting," was recognised as an improvement in the Lands Improvement Company's Act, 1853 (Sec. 6).

By that Company's Act of 1855 (Sec. 4) this provision was, however, repealed and replaced by a more extended authorisation which dropped the one-half limit and allowed "planting for shelter or for periodical cuttings which will increase the permanent value of the land and shall be approved by the Inclosure Commissioners."

A further extension was secured by the same Company's Act of 1859 (Sec. 3), which substituted "planting for shelter or for any beneficial purpose which will increase the permanent value of the land." The Scottish Drainage and Improvement Company's Act, 1856 (Sec. 4), allowed "Planting for shelter or for periodical cuttings which will increase the permanent value of the land," a phrase which was again extended by the same Company's Act of 1860 (Sec. 4) to "Planting for shelter or for any beneficial purpose which will increase the permanent value of the land," and the same terms are used in the Land Loan and Enfranchisement Company's Act, 1860 (Sec. 11).

Apart from this legislation as to the powers of private companies, the general "Improvement of Land Act, 1864," included (Sec. 9, Item No. 9) among the list of improvements the item of "planting for shelter." This statute contained a proviso (Sec. 15) that the requisition as to increased annual value should not apply to any outlay proposed to be made upon or in respect of planting. The Act was applicable to Great Britain as a whole, but so far as England was concerned the Settled Land Act, 1882, in extending the schedule of statutory "improvements" enlarged the definition of "planting" (Sec. 25), by removing the qualifications as to shelter above quoted. By the passing of the Improvement of Land (Scotland) Act, 1893, which was eventually repealed and re-enacted by the Improvement of Land Act, 1899, Scotland had, however, extended to it the same latitude in cases under the general Act of 1864 as England enjoyed in the matter of planting under the Settled Land Act, the term employed in defining the improvement being "Planting of woods or trees."

The latest amendment of the law, effected by the Improvement of Land Act, 1899, enlarged the maximum term of charge to 40 years (Sec. 4), extended all the Settled Land Act list of improvements to Scotland (Sec. 2), and by Sec. 3 enabled any improvement in that list to be carried out under the Private Companies Acts, if it had been authorised by these Acts.

As regards practice under the Acts above referred to, the total amount of money charged upon land in Great Britain in respect of planting up to the 31st December, 1901, has been £98,212 0s. 5d. The expenditure charged on estates in each of the last five years was as under:—

Year.	Amount Charged. £ s. d.
1897	2,402 12 1
1898	119 12 0
1899	86 12 6
1900	1,100 17 5
1901	529 15 8

Since the passing of the Act of 1899 nine cases have arisen where charges in respect of planting have been sanctioned by the Board. It may be added that no application for the extension of a charge for planting to a longer period of years than had already been granted has been made to the Board.

Appendix XIV.

APPENDIX No. XIV. (Q. 2887).

HANDED IN by Major P. G. CRAIGIE.

(B).—RETURNS OF WOODS.

In 1871 a special return was obtained of woods, coppices, and plantations (excepting gorse land and garden shrubberies), the acreage being ascertained by the occupier's schedule, on the ground that "woods are information available in their respective districts. The information was not obtained through the medium of the occupiers' schedule, on the ground that "woods are not often held by farmers." In the following year the collecting officers were instructed to examine the first returns with the view of testing their general accuracy, and the figures, revised accordingly, were re-published in the Agricultural Returns for 1872, the total acreage for Great Britain (excluding the Isle of Man and Channel Islands) as amended, appearing as 2,187,078 acres.

A similar return was obtained in 1880, and in connection therewith it was explained that considerable difficulties were met with in obtaining the information, as, besides the examination of rate-books, valuation lists, etc., special application had frequently to be made to the proprietors of woods, and there was often some doubt as to what land should be included in the return. It was stated that the figures were believed to be generally accurate but they were, nevertheless, amended in the following year, as the result of further enquiries which led to the addition of nearly 50,000 acres, bringing up the total area for Great Britain (excluding Isle of Man and Channel Islands) to 2,458,300 acres.

The next return was obtained in 1888 and the difficulties of securing accuracy were again referred to. The result was to show an increase during the seven years since 1881 of over 100,000 acres and to raise the total area for Great Britain to 2,560,744 acres.

It appears evident, however, that all these returns were more or less defective, and that conclusions based upon their results could not be considered to be reliable.

In 1891 the attention then being directed to the question of forestry led to the institution of a more exhaustive enquiry on somewhat extended lines. A distinction was made between "woods" and "plantations," the latter term being confined to areas planted within the previous decade. Direct personal application was made to the holders of wooded land by means of the occupiers schedule, and in many instances corrected measurements were obtained from the Ordnance Survey maps. A distinction was also made between woods and plantations on the lands of the owners and those which were occupied by tenants. As a result of the improved methods of enquiry no close comparison with previous returns is possible, but the total figures for Great Britain amounted to 2,694,575 acres, of which 102,671 acres were plantations made during the preceding 10 years. Returns were for the first time obtained from the Isle of Man and the Channel Islands.

In 1895 a further return was obtained, the methods of collection adopted being similar to those employed in 1891. It was not claimed that even these results were absolutely free from error, the difficulties arising from varying interpretations of the term "Wood" being in themselves sufficient to preclude precise accuracy, particularly in making comparisons with previous returns. But it was considered that the areas of woodland shown by this return were in fact a closer approximation than had been previously available.

The total extent of woodland in Great Britain was returned as 2,726,116 acres, of which 131,843 acres were planted since 1881. From this it appeared that 29,172 acres had been planted since the returns of 1891 were collected. As, however, the total increase of the area of Woods and Plantations during the four years slightly exceeded this figure, it is evident that the return of 1895 must have been somewhat more exhaustive than that of 1891, and still more, therefore, than those which preceded it.

Appendix XIV.

SCHEDULE.

Returns for woods, coppices and plantations were first obtained in 1871. *See* pp. 6 and 7 of the report of that year, and pp. 26 and 51-59 of the tables (C. 460).

In 1872 the figures obtained in 1871 were tested as to their accuracy and republished. *See* pp. 10 and 11 of the report, and pp. 64 and 65 of the tables (C. 675).

In 1880 a special return was again obtained. *See* p. 5 of report for that year, and pp. 46 and 47 of the tables (C. 2,727).

In 1881 the figures collected in 1880 were amended and republished. *See* pp. 6 and 7 of the report, and pp. 52 and 53 of the tables (C. 3,078).

In 1888 a special return was made. *See* pp. 11 and 12 of the report, and pp. 76 and 77 of the tables (C. 5,493).

In 1891 a return was called for in which woods were distinguished from plantations. *See* pp. 8 and 9 of the report, and pp. 48-51 of the tables (C. 6,524).

In 1895 the last return of the woods and plantations was obtained. *See* pp. 8 and 9 of the report, and pp. 36 and 37 of the tables (C. 8,073).

So far as the figures may be regarded as comparable, the table below supplies a summary of the whole of the returns which have been obtained :—

WOODS AND PLANTATIONS.

——	1871 as Amended in 1872.	1880 as Amended in 1881.	1888.	1891.	1895.
	Acres.	Acres.	Acres.	Acres.	Acres.
England - - - - - -	1,325,765	1,466,038	1,518,321	1,613,849	1,665,741
Wales - - - - - - -	126,823	162,786	167 573	174,967	181,610
Scotland - - - - - -	734,490	829,476	874,850	905,759	878,765
Great Britain - - - -	2,187,078	2,458,300	2,560,744	2,694,575	2,726,116

Appendix XV.

APPENDIX No. XV. (Q. 3142).

Handed in by Mr. C. O. Minchin.

Memorandum on the Official Practice as regards the assessment of Death Duties in respect of Timber and Woodlands.

1.—*Succession Duty under the* 16 *and* 17 *Vict. cap.* 51.

Section 23 of the Succession Duty Act, 1853, provides that where any succession comprises timber, trees, or wood, not being coppice or underwood, the net proceeds of sale of such timber, etc., if exceeding £10 in any one year shall be charged with Succession Duty (according to the interest of the successor therein).

This is held to apply to bark stripped from the trees and sold, but it does not apply to standing timber sold with the property as a whole nor to the sale money of trees which were not growing on the property at the time when the succession occurred, nor (in practice) to timber sold by a purchaser who bought the property, with standing timber, from the actual successor, nor to timber used in fencing or repair on the property.

Coppice and other wood yielding a regular income collected yearly or at other definite intervals should be brought into the general account of the property as part of the annual value of the succession. In order to arrive at the net income * "necessary outgoings" have to be allowed. These comprise :—

Expenses of selling, felling, and drawing the timber, and of restoring fences, ditches, roads (or any special parish rate for this) injured by felling and drawing the timber, so far as these fall on the vendor.

Also the proportion of the general expenses of the property attributable to the growth of the timber actually sold, including such things as the woodman's wages, cost of keeping fences in order, mole catching, etc., so far as these have not already been allowed upon the general succession account.

Furthermore, it is the practice (based upon the decision in the case of the Lord Advocate v. the Marquis of Ailsa, 19 Sco. L.R. 28) if the woodland has been brought into the general succession account at an annual value based upon the assessment on the valuation roll, not on a mere waste value, to allow a set-off for this in the timber duty account.

The successor is at liberty to commute the claims for duty which might arise in his succession upon the basis of an estimate of the net moneys obtainable by him from the sale of timber, etc., during his life, in a prudent course of management of the property.

The practice as to succession duty chargeable on deaths after 1st August, 1894 (the Finance Act, 1894) is the same as that set out above if the successor is not competent to dispose; but if he is competent to dispose then by Section 18 of the Finance Act it is assimilated to the practice for the estate duty.

2.—*Estate Duty under the Finance Act,* 1894, *deaths on or after 2nd August,* 1894.

Section 1 of the Act charges estate duty upon the principal value of all property which passes or is deemed to pass.

Section 7 (5) defines the principal value as the price which in the opinion of the Commissioners (of Inland Revenue) the property would fetch if sold in the open market at the time of the death of the deceased, but as regards agricultural property this is modified by the following proviso :—

"In the case of any agricultural property where no part of the principal value is due to the expectation of an increased income from such property, the principal value shall not exceed twenty-five times the annual value as assessed under Schedule A of the Income Tax Acts after making such deductions as have not been allowed in that assessment, and are allowed under the Succession Duty Act, 1853 (16 & 17 Vict. c. 51), and making a deduction for expenses of management not exceeding 5 per cent. of the annual value so assessed." In official phraseology this is known as the "superior limit," and this term is hereafter used for the sake of brevity.

In section 22 (1) (g) of the Act, agricultural property is defined to mean agricultural land, pasture, and woodland, including such cottages, farm buildings, farm houses, and mansion houses (together with the lands occupied therewith) as are of a character appropriate to the property.

From the first there was considerable difficulty felt as to how the value of agricultural estates on which there happened to be woods was to be measured by the Commissioners. It was at first suggested that the rule as to the application of the "superior limit" applied only to the surface, and that it did not include the woods (though they are in law held to be a part of the soil which passes to the heir) any more than it did the growing crops, which are personal estate, and pass to the next of kin.

This view was adopted in dealing with a few estates which passed soon after the date of the Act, and the values were ascertained by adding to x times the net annual value of the surface (x not being greater than 25), the saleable value of all timber whether ripe for felling or not.

Upon further consideration, and after some discussion, the practice was modified, and the value ascertained by adding to x times the annal net value of the

* *See* Question 3142

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land (x not greater than 25) the value of all timber which was actually ripe for felling at the time when the property passed, and so the practice remained for some time, when a case occurred in which the agricultural property, exclusive of timber, approximated to twenty-five years' purchase in value, and in addition there was standing in the wood (which had been well forested) a large quantity of timber of all ages, from ten years to three hundred, besides a considerable amount of underwood and coppice.

The accounting parties argued that the suggested value was an infringement of the rule as to the "superior limit," and supported their views by the opinions of two counsel of eminence.

The Commissioners, after advice taken, then adopted the following practice, which is that now in use.

If there is no such expectation of increased income as to enhance the price obtainable, then ascertain the net annual property tax value, as defined in the proviso, of all the agricultural property comprised in the estate, and multiply it by twenty-five. The value must not exceed this, but, of course, it may fall below it if the property, including the timber, is not worth so much for sale.

The Commissioners have some time since instructed their surveyors of taxes that in assessing woodlands for property tax the yearly value was to be taken to be the rent which the lands in their natural state might reasonably bring in as pasture or grazing land.

The following examples which occurred in recent practice are annexed.

(A) An extract from a timber account for succession duty. The successor (being a life tenant) was chargeable in respect of timber under Section 23 of the Succession Duty Act.

(B) Extract from an estate duty account where the value of the timber was excluded (though considerable) because the agricultural property was already brought into the account at the maximum value.

(C) Extract from an estate duty account where part of the value of timber was brought in so as to make up the value of the agricultural property to the maximum; the balance of the value of timber being excluded.

A.—*Extract from a Succession Account of Timber felled and sold.*

Form No. 10.

INLAND REVENUE.

[For Payment of Duty on Money arising from Sales of Timber.]

☞ Here state the Name and Address of the Person who forwards the Account. _____

_____

This Form of Account is for the Payment of Duty on Moneys arising from the Sale of Timber upon Property comprised in a Succession.

16 & 17 Vict. c. 51, sec. 23.

It is provided by the Succession Duty Act, 1853 (16 & 17 Vict. c. 51), s. 23, that:—"Where timber, trees, or wood, not being coppice or underwood, shall be comprised in any Succession, the successor shall be chargeable with Duty upon his interest in the net moneys, after deducting all necessary outgoings for the year, which shall, from time to time, be received from any sales of such timber, trees, or wood, and shall account for and pay the sums yearly: Provided that no Duty shall be payable on the net moneys received from the sale of timber, trees, or wood in any one year unless such net moneys shall exceed the sum of ten pounds: Provided, that if the successor shall be desirous of commuting the Duty, and shall deliver to the Commissioners an estimate of the net moneys obtainable by him from the sale of such timber trees, and wood, as may, in a prudent course of management of the property, be felled by such successor during his life, the Commissioners, if satisfied with such estimate, shall accept the same and assess the Duty accordingly."

This provision does not apply where the Succession Duty is payable in the first instance upon the principal value of the property under the Finance Act, 1894 (57 & 58 Vict. c. 30), s. 18 (1).

Timber must be sold separately from the property.

Duty is also chargeable under this section in respect of timber sold, and does not attach to growing trees sold with the property.

Repairs.

The duty does not attach to timber used for repairs; but if the timber be sold, and the proceeds be expended in the purchase of other timber or in improving the property, the duty atttaches.

Bark liable.

If the bark be stripped from the trees and sold, the sale moneys will be chargeable with duty.

Trees must have been growing when succession opened.

The duty does not extend to the sale moneys of timber from trees which were not growing upon the property at the time when the successor became beneficially entitled to the property in possession.

Wood yielding yearly profit.

Coppice and other wood capable of yielding a yearly profit should be included in the general account of the succession.

Necessary outgoings.

The necessary outgoings are those which are intrinsically necessary, and do not include any expenses incurred by the successor for his mere convenience, or for purposes of ornamentation.

What they include.

They include the expenses of the sale, the expenses of felling and drawing out the timber, and of restoring fences, ditches, roads, and gates, injured by the felling and drawing out of such timber, in so far as these expenses are borne by the vendor; also the expenses of the year in which the sale takes place in connection with the growth of the timber actually sold.

Commutation as to future sales.

Successors desirous of commuting the duty presumptively payable in respect of future sales should apply, in writing, to the Controller of Legacy and Succession Duties, and forward an estimate by a competent person showing the amounts which, in a prudent course of management of the property, are likely to be obtained during the successor's life.

☞ OBSERVE.—1. The Account when filled up in duplicate should be transmitted to the Secretary, Estate Duty Office, Somerset House, London, W.C.

2. Money should not be remitted until this account has been delivered by the parties, and the amount payable and the mode of payment have been notified to them.

Appendix XV.

REGISTER , of the Year 1 Folio .

TITLE.

(1.) Please read the instructions printed on previous page.

(2.) Insert name of successor.

(3.) Insert full postal address.

(4.) Here state the Title, whether under Will, Settlement, Intestacy, or by Descent, and if under any Deed or other Document the date thereof, and the names of the parties thereto. If under a Will, state date and place of Probate, or if under an Intestacy, state date of Grant of Administration, and where issued.

(5.) Here state name and addresses of accounting parties, and in what capacity they act.

An Account (1) of the succession to moneys arising from the sale of timber, trees and wood
of (2) *A. D. S.*
of (3)
upon the death of *A. P. B. D. S.*
who died on the *2nd* day of *October 1894*
derived from *E. A. D. S.*
the predecessor, under (4) *his Will*
delivered by (5) *the successor*
of

Date of Sale.	Gross Amount realised.	Nature of Deductions.	Amount of Deductions.	Net Amount realised.
	£. s. d.	*Wiltshire and Somerset Estate:*	£. s. d.	£. s. d.
1895	103 15 –		26 2 –	77 13 –
1896	612 – –		134 15 –	477 5 –
1897	1,927 – –	*Expenses of sale by auction, cutting and dragging, measuring, valuing and lotting*	334 18 –	1,592 2 –
1898	1,755 – –		355 1 –	1,399 19 –
1899	1,337 10 –		273 8 –	1,064 2 –
	5,735 5 –		1,124 4 –	4,611 1 –
		Devonshire Estate:		
1895	34 8 –		156 19 3	412 16 8
1896	670 11 3		135 3 4	
1897	290 18 8	*Expenses of sale, cutting, dragging, measuring, planting, &c., and work in woods*	117 11 11	173 6 9
1898	217 16 3		94 10 –	123 6 3
1899	126 – 10		94 – 11	31 19 11
	1,339 15 –		598 5 5	741 9 7
If the space be insufficient a schedule may be annexed.		Total - - - £.		5,352 10 7

DECLARATION :—

I (or) We declare that this is a just and true Account of all the moneys received since the *2nd* day of *October 1894*, from the Sale of Timber, Trees, and Wood, not being coppice or underwood, on the property to which *A. D. S.* was entitled to succeed beneficially upon the Death of the before-named

(1) State the consanguinity in the words of the Act. (See back of Form.)

and that the said *A. D. S.* is a (1) *descendant of a brother of* *E. A. D. S.* the Predecessor from whom the said Property is derived.

Dated this *16th* day of *February 1901.*

(*Here sign he Account.*) *C. W. and W. for the Successor.*

Appendix XV.

For Official use only.]

ASSESSMENT.

The Succession Duty on the within sum of	£	5,352	10 7
at the rate of 3 per cent. is assessed at		160	11 6
Interest thereon		12	8 10
	£	173	- 4

Somerset House,
London, W.C.

By the Commissioners

Examiner.

22nd February 1901.

RECEIPT FOR DUTY.

Received the day of 190

the sum of

being the Amount mentioned in the above Assessment.

£ „ „

Registered,

pro Accountant. *pro* Cashier.

For Acct. and Compt. Genl.
of Inland Revenue.

RATES OF DUTY.

	Where the Deceased died before the 1st July 1888, or where Estate Duty under the Finance Act, 1894, has been paid upon the property.	Where the deceased died on or after the 1st July 1888, and Estate Duty under the Finance Act, 1894, has not been paid upon the property.
* Lineal Issue or Lineal Ancestor of the Predecessor	1 per cent.	1½ per cent.
Brothers and Sisters of the Predecessor and their Descendants	3 do.	4½ do.
Brothers and Sisters of the Father or Mother of the Predecessor and their Descendants.	5 do.	6½ do.
Brothers and Sisters of a Grandfather or Grandmother of the Predecessor and their Descendants.	6 do.	7½ do.
Persons of more remote consanguinity or Strangers in Blood	10 do.	11½ do.

* Persons otherwise chargeable with Duty at the rate of 1 per cent. are exempt in respect of any property which passes under the Deceased's will or intestacy or under his disposition or any devolution from him, or under any other disposition under which respectively Estate Duty under the Finance Act, 1894, has been paid.

The Husband or Wife of the Predecessor is not chargeable with Duty, and a Successor, whose Husband or Wife is of nearer relationship to the Predecessor, is chargeable with Duty at the rate at which such Husband or Wife would be chargeable. The relations of the Husband or Wife of the Predecessor are chargeable with Duty at 10 per cent., or at 11½ per cent., as the case may be, unless themselves related in blood to the Predecessor.

☞ OBSERVE.—1. The Duty is payable yearly in respect of the net proceeds of sale of timber received in the year, provided such net sale moneys exceed 10*l*.

2. Interest at the rate of 3 per cent. per annum is chargeable upon all Succession Duty in arrear, under the provisions of the Finance Act, 1896 (59 & 60 Vict. c. 28), s. 18 (2).

3. The liability to account for and pay the Duty in no way depends upon application being made by the Commissioners.

Appendix XV.

B.—*Extract from an Estate Duty Account. The entire Agricultural Estate, including the Woodlands, was bought in at 25 years' purchase, so nothing additional was claimed for Timber.*

[For use where the Deceased died at any time AFTER the 1st August, 1894.]

INLAND REVENUE. ESTATE DUTY. Finance Acts, 1894 to 1900.

[This form is for property chargeable with Estate Duty on an "Account." *See* Finance Act, 1894, sect. 6 (4). A separate form (C—2) is provided for "Settlement Estate duty" on settled property. See sect. 5 (1) (*a*).]

FORM C—1.

[This form should be filled up in duplicate, and be transmitted to the Secretary, Estate Duty Office, Somerset House, London, W.C.; only one copy need be sworn.]

Full Instructions as to Estate Duty will be found in the form A—2.

Official Reference—

Regr._____1_____ Fo._____ Affidt._____

☞ Here state the name and full address of the person who forwards this account _____

An "ACCOUNT" of property chargeable with ESTATE DUTY on the death of *A. B.*

late of _____ who died on the _____

day of _____ *1898*, and to whom Represention was granted at _____

on the _____ day of _____ 1_____.

TITLE.

Date and short material particulars of disposition, with date of and names of parties to any deed, and name of any testator and date of probate of his will.	Names and addresses of present trustees.	Names and addresses of *living* beneficiaries. If any of the persons originally entitled are dead, give dates of death and of representation.	Consanguinity to the deceased.	Consanguinity to the Predecessor (naming him) under whose disposition the property is derived.
Under Settlement and Re-settlement.				

* * * * * * *

Appendix XV.

Part III.—REAL PROPERTY [not including (i.) Leaseholds for years or (ii.) Real Property subject to a trust for conversion in the Deceased's lifetime.]

Insert in this column consecutive numbers opposite each item of property.	Description of property, including situation, tenure, quantity, tenants' names, and nature of tenancy, and distinguishing between arable, meadow, pasture, orchards, gardens, woods, moors, commons, wastes, pleasure grounds, building land, &c.	Rental, if let, or gross (not rateable) value for the poor rate, if unlet, and not assessed to Property Tax.	Gross value for property tax (not the reduced assessment for collection, under Finance Act, 1894 s. 35).	Nature of deductions from gross annual value. [Tenants' outgoings should not be deducted unless payable by landlord.]	Amount of annual deductions.	Net Annual value.	No. of years' purchase as estimated.	Estimated principal value as at the date of the Deceased's death, and gross amount realised, if since sold.
	Agricultural property:	£. s. d.	£. s. d.		£. s. d.	£. s. d.		£. s. d.
1.	*Various items* - - - - -	1,983 17 1	1,981 5 -	*Repairs, insurance, management.*	261 15 10	1,719 9 2	25	42,986 9 2
.	*228 a. 1 r. 2l. p., woodlands, plantations, and timber (in hand).*	—	71 - -	*Repairs and management, 5 per cent.*	3 11 -	67 9 -	25	1,686 5 -
						GROSS TOTAL - - £.		44,672 14 2

OBSERVE.—As to agricultural property, *see* Finance Act, 1894, ss. 7 (5) and 22 (1) (*g*).
If the real property include unlet fishing or sporting rights, church patronage, timber, unlet building land, mines or other property which has no annual value, or the annual value whereof is no criterion of the principal value, full details should be given.
Generally, as to all property, all such particulars should be furnished as are requisite to arrive at the principal value.
Should the space be insufficient, the account and schedule should be continued upon separate sheets.

NOTE.—Item 2 was originally valued upon the basis of the value of the timber, viz., at 11,295l., but as the whole of the purely agricultural land was valued at 25 years' purchase this valuation was reduced to the value of the land on basis of gross property tax assessment. Thus loss in value = 9,608l. 15s., and duty reduced by 621l.

Schedule of Debts and Incumbrances on the above Real Property.

Items of property numbered as in the above Account.	Nature of debt or incumbrance and by whom created.	Short material particulars of security, with date of and names of parties to any deed, and name of any testator and date of probate of his will.	Names and addresses of persons to or in whom the debt or incumbrance is now due or vested.	Amount of the debt or incumbrance.
				£. s. d.
			TOTAL DEDUCTIONS - - - £.	
OBSERVE.—Terminable charges should be capitalised.			NET TOTAL - - - - - - £.	

C.—*Extract from an Estate Duty Account.—The surface of the agricultural property was bought in at 23 years' purchase. Part of the value of the timber was added so as to bring the total value up to 25 years' purchase and the balance of the value of timber was struck off.*

[For use where the Deceased died at any time AFTER the 1st August 1894.]

INLAND REVENUE.

ESTATE DUTY,
Finance Acts, 1894 to 1900.

[This form is for property chargeable with Estate Duty on an "Account." *See* Finance Act, 1894, sect. 6 (4). A separate form (C—2) is provided for "Settlement Estate duty" on settled property. *See* sect. 5 (1) (*a*).]

FORM C—1.

[This form should be filled up in duplicate, and be transmitted to the Secretary, Estate Duty Office, Somerset House, London, W.C. Only one copy need be sworn.]

Full instructions as to Estate duty will be found in the form A—2.

Official Reference—

Regr 1_____. Fo._____ Affidt._____

☞ Here state the name and full address of the person who forwards this account -

AN "ACCOUNT" of property chargeable with ESTATE DUTY on the death of *J. H.*
late of _____
who died on the _____ day of _____ *1898*, and to whom Representation wa
granted at _____ on the _____ day of _____ 1_____.

TITLE.

Date and short material particulars of disposition, with date of and names of parties to any deed, and name of any testator and date of probate of his will.	Names and addresses of present trustees.	Names and addresses of *living* beneficiaries. If any of the persons originally entitled are dead, give dates of death and of representation.	Consanguinity to the deceased.	Consanguinity to the Predecessor (naming him) under whose disposition the property is derived.
By Settlement dated 25 June 1863.				

* * * * * * *

Part III.—REAL PROPERTY [not including (i.) Leaseholds for Years or (ii.) Real Property subject to a trust for conversion in the Deceased's lifetime.]

Insert in this column consecutive numbers opposite each item of property.	Description of property, including situation, tenure, quantity, tenants' names, and nature of tenancy, and distinguishing between arable, meadow, pasture, orchards, gardens, woods, moors, commons, wastes, pleasure grounds, building land, &c.	Rental, if let, or gross (not rateable) value for the poor rate, if unlet and not assessed to Property Tax.	Gross value for property tax (not the reduced assessment for collection, under Finance Act, 1894, s. 35).	Nature of deductions from gross annual value. [Tenant's outgoings should not be deducted unless payable by landlord.]	Amount of annual deductions.	Net annual value.	No. of years' purchase assumed.	Estimated principal value as at the date of the Deceased's death, and gross amount realised, if since sold.
		£. s. d.	£. s. d.	£. s. d.	£. s. d.	£. s. d.		£. s. d.
1	*Surface land* - - - - -	6,896 - -	—	—	1,175 8 9	5,220 11 3	23	120,072 18 9
2	*Amount brought in in respect of growing timber on before-mentioned properties sufficient to bring the total principal value of the agricultural property up to 25 years of net rental.*	—	—	—	—	—	—	10,441 2 6*
						GROSS TOTAL - - £.		135,514 1 3

OBSERVE.—As to agricultural property, *see* Finance Act, 1894, ss. 7 (5) and 22 (1) (*g*).
If the real property include unlet fishing or sporting rights, church patronage, timber, unlet building land, mines or other property which has no annual value, or the annual value whereof is no criterion of the principal value, full details should be given.
Generally, as to all property, all such particulars should be furnished as are requisite to arrive at the principal value.
Should the space be insufficient, the account and schedule should be continued upon separate sheets.

* *NOTE.—This valuation was originally £1,181.*

Schedule of Debts and Incumbrances on the above Real Property.

Items of property numbered as in the above Account.	Nature of debt or incumbrance and by whom created.	Short material particulars of security, with date of and names of parties to any deed, and name of any testator and date of probate of his will.	Names and addresses of persons to or in whom the debt or incumbrance is now due or vested.	Amount of the debt or incumbrance.
				£. s. d.
			TOTAL DEDUCTIONS - - - £.	
OBSERVE.—Terminable charges should be capitalised.			NET TOTAL - - - - - - £.	

Appendix XVI.

APPENDIX No. XVI. (Q. 3553).

HANDED IN by Professor H. MARSHALL WARD.

OUTLINE SKETCH OF FORESTRY COURSE.

Part I.

Botany,
Chemistry,
Mechanics and Physics,
Geology.

Here the students would pass through the general course, and aim at obtaining a thorough grounding in the principles of these branches of science. They would attend the same lectures and laboratory courses as do the agricultural students, but attention should be directed in their schedule to those parts which have a special bearing on forestry. I would suggest, *e.g.*,

Botany.—The elements of the morphology, histology and anatomy, and the physiology of the flowering plants.

The phenomena of germination, and the changes which occur in sprouting buds, tubers, etc. The organography of roots, stems, leaves, &c. The relations of roots to soil, the phenomena of absorption, and the nature of the salts absorbed by roots. The structure of wood, and the phenomena of the ascent of water in trees. The description of leaves, their anatomy, and the functions of transpiration, respiration, assimilation of carbon, &c. The nature of cell-walls and cell contents, liquefaction, the formation and utilisation of starch, sugar, oil, &c. The living cell contents, cell division, and the structure and functions of cambium: growth in thickness and in length. The importance of light, temperature, and other factors of the physical environment. The structure and functions of flowers, with especial reference to those of forest trees and the phenomena of reproduction, hybridisation, grafting, budding, pruning, etc.

The elements of classification as illustrated by European forest trees, shrubs, and herbs. More detailed study of the Natural Orders — Coniferæ, Salicaceæ, Betulaceæ, Fagaceæ, Corylaceæ, Juglandaceæ, Ulmaceæ, Tiliaceæ, Aceraceæ, Celastraceæ, Rosaceæ, Leguminosæ, Platanaceæ, Myrtaceæ, Rubiaceæ, Caprifoliaceæ, Gramineæ.

The principal groups of Cryptogamic plants, with special reference to fungi.

In chemistry, mechanics and physics and geology, I should suggest that the students attend the same courses as the agricultural students, their attention being directed in the schedules to certain special points bearing on forestry.

Others would doubtless be willing to aid in drawing up the special schedules.

It will be noted that the whole course of instruction here sketched is already given at Cambridge, and is in full working order so far as agricultural students are concerned.

I would urge that especial attention be given to experimental physics and mechanics, and to chemistry and physical geology.

Part II.

Special Forest Botany and Natural History.

Forest Botany.—Special study of the structure and properties of the various kinds of wood. The identification of wood, and of species of trees by their leaves, buds, &c. The diseases of timber and of forest plants generally, with especial reference to the following:

Disease.—The connection between normal and abnormal physiology. Cause and investigation of disease.

Injuries due to higher parasites. Mistletoe, Loranthus, Cuscuta, Orobanche, other phanerogamous parasites, Epiphytes, weeds.

Epiphytic and Saprophytic fungi. Parasitic fungi. The chief diseases due to fungi. Killing of seedlings by Pythium, Phytophthora, and the destruction of beech and other seedlings. Disease caused by Ustilagineæ Uredineæ, and the damage they do to conifers and other trees. Wound-parasites, Hymenomycetes, and the destruction of timber. Dry rot, Erysipheæ, and mildews on leaves, Pyrenomycetes, and the destruction of seedlings by Rosellinia. Other diseases due to Pyrenomycetes, Parasitic discomycetes, Peziza, and the larch-disease. Other parasitic diseases.

Wounds.—Healing by cork, occlusion, excretions of resin, turpentine, &c. Burrs and adventitious buds, &c.

Diseased conditions caused by abnormal states in soil, &c. Their explanation and treatment dependent on knowledge of physiology. Dying off of twigs. Stagnation of air and water in soil. The rotting of roots. Poisons, action of frost. Intense insolation. Smoke and acid gases in air. Lightning. Other injurious factors.

Perhaps special courses in the biology of soil, bacteriology, &c., would be desirable in addition.

Forest Zoology (including Entomology).

A more special knowledge of the habits and life history of various birds and other animals of importance in woodlands, either as enemies to trees or to insects, and in particular the study of entomology from the point of view of the forester.

Part III.

Forestry. Sylviculture.

Forest soils and certain peculiar relations of trees to soil and climate. The formation of woods. Planting. Pure and mixed forests, sylvicultural systems. Natural and artificial regeneration. The tending of growing woods. Thinning and pruning. Felling.

Forest management; normal and abnormal forests; how forests degenerate, and how to convert abnormal forest into normal forest. Reserves. Arrangement of cuttings. The division, survey and mapping of forests. Selection of special system and rotation. Measurement. Determination of age, increment, volume, etc. Yield tables and regulation of yield. Working plans.

Forest Utilisation.—Felling and preparation, disposal and transport of timber. Accessory forest products, bark, fibres, resin, dyes, etc. Technical properties and treatment of timber for industrial purposes. Sawing. Charcoal, etc.

Forest Protection.—Measures to be taken against damage by man and other animals, especially insects and against injury by weeds, parasites, and especially fungi. Precautions as regards extremes of climate, snow, flooding, etc. Forest legislation and administration.

As regards the more special courses of instruction in surveying, accounts, forest engineering, etc., I should think there could be little difficulty in arranging for the adaptation of courses already given to agricultural students to the slightly different needs of foresters, though in my opinion these technical subjects are best given at a special school.

Appendix XVII.

APPENDIX No. XVII. (Q. 3643).

HANDED in by Mr. JOSEPH PARRY, M. Inst. C.E.

STATEMENT showing the NUMBER of TREES planted on CORPORATION LANDS around LAKE VYRNWY, 1896–1902.

Species.	Number.	Species.	Number.
Larch	25,430	Weymouth Pine	6,000
Scots Fir	42,600	Beech	15,250
Douglas Fir	13,380	Sycamore	4,400
Spruce Fir	15,500	Ash	10,000
Corsican Pine	28,400	Alder	1,300
		TOTAL	162,260

Appendix XVIII.

APPENDIX No. XVIII. (Q. 3734).

HANDED in by MR. MARTIN ROBERTS.

Oak.

The Postmaster-General for a number of years past has taken all possible steps to obtain sufficient supplies of native-grown oak for telegraph construction purposes. These steps have consisted in largely advertising in the timber trade and local newspapers, and obtaining from Post Office engineers in the provinces, the names and addresses of likely English timber merchants, and inviting them to tender. He has, however, found it impossible to obtain native oak at reasonable prices in sufficient quantities to fully meet the Post Office requirements, and consequently experiments have from time to time been made by the Post Office Department to determine the relative merits of foreign-grown oak and other descriptions of timber, and in connection with these experiments figures have been obtained which enable me to put in comparative tables showing the strength of native as compared with foreign-grown oak.

Oak. Method of testing.

In telegraph construction oak is mainly employed for the cross arms on telegraph poles; when so used it is subjected to two strains, *i.e.*, cantilever and torsion. I am putting in drawings showing the method adopted for testing oak telegraph arms. The Post Office has now practically only one length of arm in use, namely 48 inches, and the tests have in all cases been made with arms of this length, with a cross section of 2½ inches by 2½ inches. In the case of the cantilever tests the arm is secured in the centre by a bolt ⅝in. in diameter and a washer. One end of the arm presses against a solid block of iron to give a suitable bearing, and the other end is tested by a direct transverse strain. For the torsional test the centre attachment and the support at the disengaged end are similar to those I have just described, and the torsional strain is applied to the equivalent of an ordinary telegraph insulator, the deflection and the weight required to cause fracture being recorded. In the diagram the strain is shown as applied at the groove of the insulator 4 inches above the upper plane of the arm, but in practice the insulator is dispensed with, and an attachment is used to give the same leverage.

Oak. Results of tests.

Tables 1 and 2 give the results of cantilever tests of native and foreign oak respectively. The average for native timber comes out the higher, but this is largely due to the very low results given by some specimens of Hungarian oak, and I should not be prepared to say that for cantilever tests well selected foreign oak would give appreciably lower results than average English oak. In the case of the torsional tests, however, the figures are almost invariably very much in favour of native timber. Recent tests are recorded in Tables 3 and 4, and from the results obtained it will be seen that if we represent the strength of native oak as 100 when subjected to torsion, the average strength of foreign would be represented by 79·7.

The results given in Tables 1, 2, 3, and 4 are fairly representative of my experience extending over a number of years with the exception, perhaps, that the figures given for Irish and Scotch oak are somewhat above the average, due to recent deliveries of this timber being of high quality, whereas recent deliveries of English oak appear to be rather below the average.

It is noteworthy that South Russian oak, which gives an excellent average when subjected to a cantilever test, comes out no better than other Continental oak when subjected to the torsional test, and it is perhaps right that I should say that although Scotch oak gives such excellent figures in both tests, the Post Office has experienced the greatest possible difficulty in obtaining Scotch oak for arms. I understand this is due to Scotch timber as a rule being small, and consequently the waste in cutting the arms free from sapwood, and the heartshake makes the business unremunerative.

I am unable to express any definite opinion as to the reason why native oak as a rule stands such a much greater torsional or twisting strain than oak grown on the Continent, but I have reason to think it is owing to English oak being, as a rule, grown in open situations instead of its being close together in woods. This opinion is based on the fact that I have from time to time met with very straight grown and clean English oak, which timber merchants have described to me as "coppice grown," and I have generally found that such oak will not give the torsional results obtained from specimens of rougher growth.

Oak, Effect of seasonin

In Tables 1, 2, 3, and 4 the weight is given of each arm tested. The considerable variation in weight is largely due to seasoning, and I do not attach very great importance to these figures, but it is interesting to observe the very high results obtained with the Scotch samples, although in the average they are lighter than any other specimen of native timber. These figures show that the strength of oak is not reduced by seasoning within moderate limits.

As many English timber merchants are without machinery to manufacture arms, to increase the sources of supply the Postmaster-General accepts oak in the form of scantling and converts this oak into arms at one of the telegraph factories. The Post Office specification for oak scantling is put in (see p. 195).

I have from time to time made tests of various descriptions of timber other than oak for use for telegraph arms, and at the present time an Australian wood, named "Karri," is largely used, but this timber is not as suitable as English oak if the latter could be obtained in sufficient quantities to meet the Post Office requirements.

Scotch fir, use of, for telegraph poles.

During the autumn of 1892, Mr. John Campbell, a timber merchant in Inverness, issued a printed circular letter asking the recipient to urge the Postmaster-General to adopt Scotch fir for telegraph poles instead of foreign timber. The circular letter was as follows:—

"Sir, "20th October, 1892.

"I beg to draw your attention to the Government contracts for telegraph poles. They are advertising for tenders at present for the supply of Norway red fir poles, and the time expires for receiving these tenders on Friday the 21st.

Appendix XVIII.

"I would take it as a great favour if you would use your influence in trying to get the Postmaster-General to go in for our native Scotch fir. It is well known that this class of wood is much superior to the foreign, where durability is concerned, and it can also be got quite straight for all practical purposes.

"I think you will agree with me in saying that the Government ought to do their utmost to foster the native industry where the timber can be acquired at about the same rates as the foreign.

"It is important that some pressure should be used at once on the Postal Telegraph Department, otherwise they will close with some foreigners for next year's supply, consequently this market will be closed to us in the native timber trade for another year.

"We were never more in need of a stimulant to the native industry than at present, as prices have not been so bad for the last forty years as they are at this moment, and are likely to be during the ensuing winter and spring unless the Government can be induced to try our native fir for telegraph poles, which would help us to tide over this depression in our trade.

"I am,
"Your obedient servant,
"JOHN CAMPBELL,
Wood Merchant."

Mr. Campbell also on the same date submitted a tender to the Post Office for the shorter lengths of poles required for the Telegraph Department during the following year. Mr. Campbell's prices, as a whole, were considerably in excess of the tender which was ultimately accepted for Norwegian poles, but apart from the question of price, and the question of the suitability of the timber, it would have been impossible for the Postmaster-General to place an order with Mr. Campbell for the shorter lengths of poles only, as the Postmaster-General would then have been unable to obtain the longer poles required, as foreign timber merchants decline to quote for long poles only, owing to the difficulty which is experienced in obtaining suitable long timber, and also owing to the expense of shipping long poles without shorter poles to fill up broken stowage; consequently, quotations can only be obtained for long poles when short poles also are ordered.

Efforts made by the Postmaster General to obtain Scotch timber for telegraph poles.

The Postmaster-General, however, invited Mr. Campbell and certain other timber merchants to tender for 50 poles as samples to the following specifications for sizes, and a trial order was placed during January, 1893:—

SPECIFICATION for Scotch Fir Poles.

Number.	Description.	Length.	Diameter at top under bark.		Minimum Diameter at 5 feet from butt.
			Minimum.	Maximum.	
		Feet.	Inches.	Inches.	Inches.
20	Poles, light - - - -	28	5	6	7
20	„ medium - -	30	6	7¼	8¾
10	„ stout - - -	30	7½	9½	10¾

Thirty-three poles out of the 50 ordered were supplied during the following spring, and the report of the officer deputed to examine them was as follows:—

"I attach a detailed statement as regards length and sizes of Scotch fir poles lying in Aberdeen pole yard. This is the first opportunity I have had of examining each pole separately, and I was so badly pleased with them that I took careful measurements, and made minute examination of each pole, and I think only the first nine enumerated are fit for our work.

"The three linemen here could do nothing with them alone owing to the great weight of the poles, and I had to get other two men to assist in *moving* them. The barking and dressing of these poles is also a tedious and expensive process owing to the innumerable knots in the Scotch fir.

"22nd April, 1893."

STATEMENT referred to in Inspector's Report.

Length.	Diameter. at top in inches.	Diameter at butt in inches.	Diameter five feet from butt in inches.	Remarks.
Feet Ins.	Inches.	Inches.	Inches.	
28 3	6	12	9·6	Good pole.
28 3	6½	11	9·9	Good, but knotty.
28 5	6	11½	9·	- - ditto.
28 6	7	11½	10·2	- - ditto - and heavy.
28 6	6	10½	9·6	- - ditto.
29 0	5¾	10	8·3	Good stick.
30 3	6	11½	9·	Fairly good.
30 3	6	11	9.6	Good, but many knots.
30 6	6¾	11½	9·2	- - ditto - ditto and heavy.
26 7	7	10	9·9	Ugly stick and heavy.
28 0	5½	10½	9·2	Some bad bends at top end.
28 2	6	11	9·9	Badly bent at upper end.
28 5	5½	10¾	8·	Bent at centre.
28 5	6	12	10·2	Bent badly and heavy.
28 5	6	10	9·6	Crooked throughout, and especially at top.
28 5	6½	11	9·2	Bent at centre.
28 6	6¼	11	9·2	Big bend 4 feet from top.
28 7	6	12	10·2	Bent at middle.
29 0	6	14	10·5	Heavy stick and twisted.
30 3	7	12	10·9	Ditto, and bad bend at centre.
30 3	8	13	11·5	Ditto, three bends, innumerable knots.
30 2	7	12½	10·8	Ditto, and twisted.
30 4		12	11·5	Stout all along and bent.

STATEMENT referred to in Inspector's Report—*continued*.

Length.	Diameter at top in inches.	Diameter at butt in inches.	Diameter five feet from butt in inches.	Remarks.
Ft. Ins.	Inches.	Inches.	Inches.	
30 5	7½	12	10·8	Bent at upper end.
30 5	6½	13	9·2	Twisted.
30 5	9	13½	12·4	Tremendous weight.
30 6	7	13	11·14	Bent badly.
30 6	7	12	10·5	Crooked and heavy.
30 10	9	14	12·	All knots, bent, and heavier than our 50 feet poles.
30 11	7	13	11·5	Heavy stick, bent and knotty.
31 0	8½	15	12·4	Very heavy; could never be lifted to "set."
31 0	7	11½	10·8	Stout throughout, bent, ugly.
31 1	7½	14	11·5	Very heavy, ugly, and very knotty.

22 April 1893.

It is understood that the poles were supplied from Aberdeenshire.

As it was thought the contractors had perhaps not fully understood the requirements, a further order was placed for 75 poles, with the understanding that the poles for this order should be obtained from other districts, and it was ultimately arranged, on the contractors' suggestion, that one truck load should come from Perthshire, one from Deeside, Aberdeenshire, and one from Ross-shire. This order was never executed in full, but 57 poles were ultimately accepted. The most suitable parcel was received from Novar, in Ross-shire, and the inspector's report on these 25 poles is given in the following statement:—

Length in feet.	Diameter at butt in inches.	Diameter 5 feet from butt in inches.	Diameter at top in inches.	Remarks.
Ft. ins.	Inches.	Inches.	Inches.	
28 4	10	8	5½	Very nice pole.
28 4	9½	8½	5½	Good straight pole.
28 5	9	8	6	- ditto.
28 5	10¾	8	6	Very good pole.
28 5	12	9½	6½	- ditto.
28 5	12	8½	7	- ditto.
28 6	11	9½	6¼	Fair.
28 6	11	9½	6	Good light pole.
28 6	11¾	9¼	7	Good.
28 7	12	10¼	7	Good, straight, but heavy.
30 4	14	11¼	7½	Ugly stick and heavy.
30 4	14¾	10¾	8¼	Good, but heavy.
30 6	12½	11	7¼	- ditto.
30 6	12	10½	7¼	- ditto.
30 6	11¼	10¼	7¼	- ditto.
30 6	12	10¼	7¼	- ditto.
30 7	11	9¾	6¼	- ditto.
30 7	15	10¾	8	Very ugly stick, and heavy.
30 8	12	10½	8¼	- ditto - and badly dressed.
30 8	12½	11½	7½	Good. but stout and rough.
30 8	13	9½	6¾	Good.
30 8	12	8¾	6½	Very pretty stick.
30 8	12	10¼	6½	Good.
30 9	12	10½	8	Heavy pole and not a beauty.
30 10	14	10¾	8½	- ditto - but good.

A further order was subsequently placed for 20 22ft. light, 20 26ft. light, and 10 30ft. medium poles. This order was never satisfactorily executed. During the latter part of 1893 further invitations to tender for 50 sample poles were issued to eight firms. One timber merchant only tendered, and, on an order being placed, the poles were supplied from Forfarshire. These poles were described as a fairly good lot in appearance, but the timber generally was less straight than Norwegian fir, and it contained many large and rough knots.

During 1897 a further trial order was placed for 100 Scotch fir poles. In this case the poles were supplied from Deeside, Aberdeenshire, and the quality of the timber was practically the same as the parcel from Ross-shire in 1893.

Relative merits of Norwegian and Scotch fir.

During the year 1885 a number of experiments had been made by the Post Office to determine the strength of Norway red fir telegraph poles, and it was thought desirable to make tests of certain representative Scotch fir poles supplied under the trial orders referred to above to determine the strength of Scotch fir telegraph poles as compared with Scandinavian. The results of the tests made of the Norwegian poles are given in Tables 5 and 9, and of the Scotch fir poles in Tables 6, 7, 8, and 10.

The testing apparatus used to determine the strength of the various specimens was specially constructed for the purpose. It is shown in the accompanying drawing. A stout wrought iron cylinder, six feet long, was secured on a suitable framing. About 5ft. 6in. of the butt end of the pole to be tested was placed inside this cylinder, and carefully packed all round and tightly rammed with gravel. The cylinder was then secured horizontally, and a scale pan suspended from what would be the resultant point of a line of telegraph wires, an oak plank being used as a saddle to distribute the load. The weights furnished in the tables in Column W comprise the weight of the scale pan and saddle, the added weights, and the calculated weight, applied at Q., of the unsupported length of the pole.

Table 5 gives the result of tests made with creosoted Norwegian poles, and tables 6, 7, and 8 the result of tests made with creosoted Scotch fir poles.

Appendix XVIII.

Summarised, the result of the tests of creosoted Norwegian, as compared with creosoted Scotch fir poles, is as follows:—

Table.	Description.	Average of K.	Relative Strength, *i.e.*, Relative Value of K.
5	Norwegian, creosoted	1,337·12	100
6	Scotch fir, creosoted, 1894	1,182·67	88·44
7	- - ditto - - 1895	953·54	71·31
8	- - ditto - - 1897	1,223·68	91·51

It is perhaps somewhat unfortunate, so far as the inquiry of this Committee is concerned, that most of the tests were made with poles which had been creosoted, but the tests of the Norwegian timber were originally undertaken to determine the strength of creosoted poles for telegraph purposes, and as the general comparison is made with creosoted timber, the figures probably fairly represent the relative value of Scotch and Scandinavian fir for telegraph purposes.

I have, however, the results of three tests made of uncreosoted Norwegian timber and three of uncreosoted Scotch fir. These figures are respectively given in Tables 9 and 10, and it will be seen that they are in close agreement with the comparative results obtained from creosoted timber:—

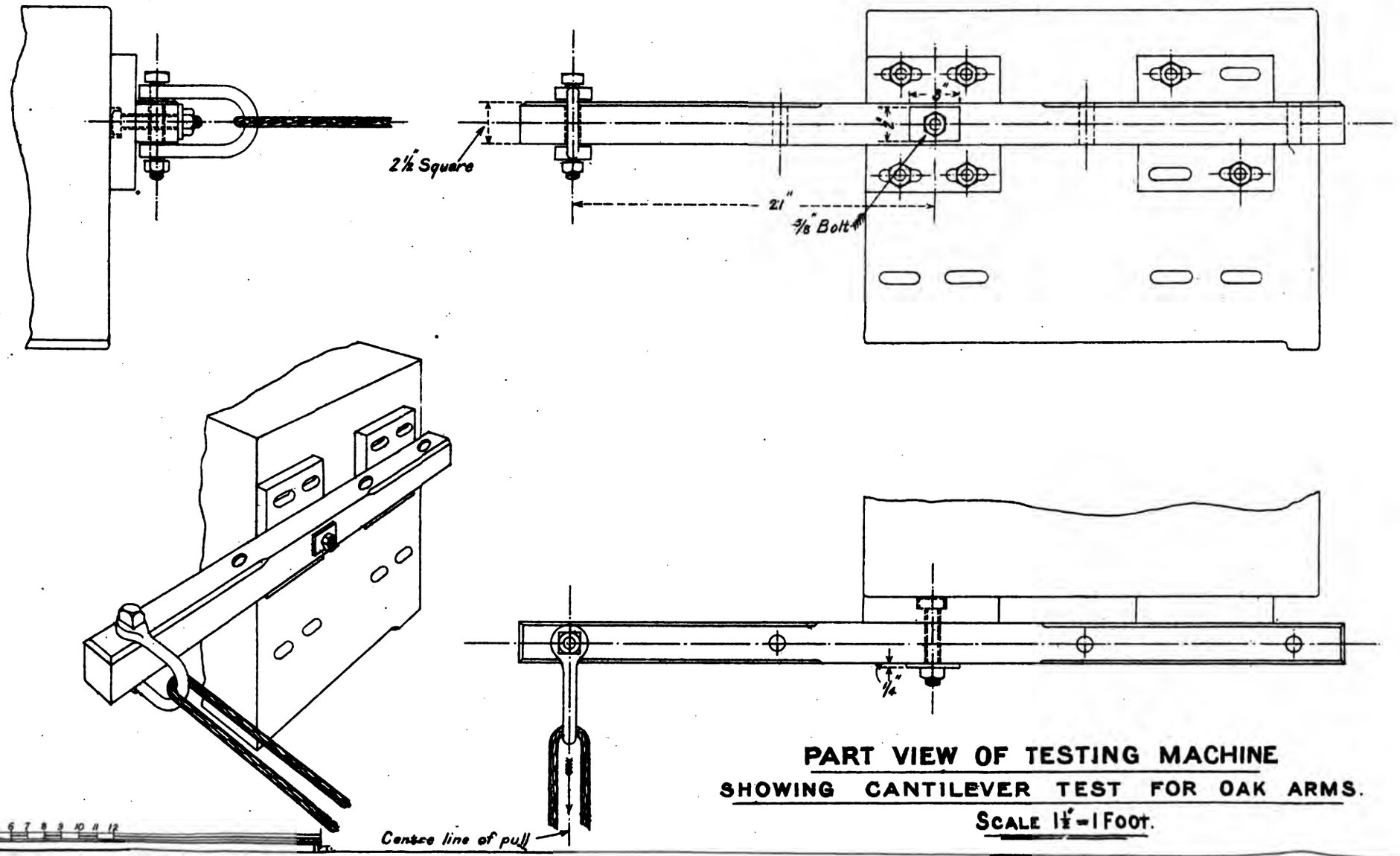
Table.	Description.	Average of K.	Relative Strength, *i.e.*, Relative Value of K.
9	Norwegian, uncreosoted	1,231·62	100
10	Scotch fir uncreosoted	998·15	81·04

I am unable to say why Scotch fir compares so unfavourably with Norwegian fir. The explanation which has been given to me by Scotch timber merchants is that Scotch fir is grown much quicker than Norwegian, and on richer soil. It should, however, be remembered that in the Postmaster-General's specification for Norway timber, a copy of which I put in (*not printed*), hard grown poles with a small amount of sapwood are specified for, and, before orders are placed, suitable precautions are taken to ensure that poles in compliance with the specification will be supplied, and, further, the poles are subjected to rigid inspection before acceptance. It would consequently not be correct to assume that the comparison made in the case of telegraph poles supplied to the Postmaster-General fairly represents the value of Scotch as compared with Norwegian timber used for other purposes. For example, the bulk of the Norwegian mining timber imported, so far as my experience goes, would compare unfavourably with well-grown Scotch fir.

Apart, however, from the question of the strength of the timber, it does not appear probable that long, straight Scotch fir poles, *i.e.*, poles from 40 to 75 feet in length, are obtainable, and from the poles supplied under the trial orders it would appear that even with the shorter lengths much difficulty would be experienced in getting shapely poles.

Larch poles are used only to a very limited extent for telegraph construction purposes, as it is not possible to inject creosote oil into larch. Larch poles.

DIAGRAM I.



PART VIEW OF TESTING MACHINE

SHOWING CANTILEVER TEST FOR OAK ARMS.

SCALE 1½" = 1 FOOT.

TABLE I.

CANTILEVER TESTS OF OAK ARMS.

Native (English, Scotch, Irish)

$$K = \frac{WL}{BD^2}$$

W = Load in lbs. at collapse.
L = Leverage in inches (21″ in all cases).
B and D = Breadth and depth of section in inches (2½″ in all cases).

County in which Timber was grown.	Weight of Arm.	Set (in 64ths of an inch) with load of (lbs.).										W.	K.
		224		448		672		896		1,120			
		Temporary.	Permanent.	Temporary.	Permanent.	Temporary.	Permanent.	Temporary.	Permanent.	Temporary.	Permanent.		
	lbs. oz.												
Cumberland	11 0	18	Nil.	36	Nil.	68	4	98	8	164	24	1,375	
Gloucestershire	10 9	14	„	32	„	44	Nil.	66	Nil.	–	–	1,120	
Ditto	9 13	18	„	38	„	56	2	94	6	–	–	1,041	
Worcestershire	9 12	20	„	40	2	58	4	110	6	190	20	1,176	
Ditto	9 1	20	„	40	Nil.	68	2	104	8	–	–	1,064	
Surrey	9 5	16	„	30	„	50	2	78	4	116	10	1,200	
Hants	9 10	16	„	40	„	56	2	86	6	154	18	1,131	
Averages (English)	9 14	17·4	Nil.	36·5	0·3	57·1	2·3	90·9	5·4	–	–	1,158	1,556
Stirlingshire	—	12	Nil.	24	Nil.	40	2	60	4	100	8	1,344	
Perthshire	8 4	12	„	28	„	46	2	68	3	90	4	1,536	
Ditto	8 12	16	„	30	„	48	3	66	4	94	6	1,355	
Averages (Scotch)	8 8	13·3	Nil.	27·3	Nil.	44·7	2·3	64·7	3·7	94·7	6	1,412	1,898
Louth	11 9	14	Nil.	34	2	46	4	68	6	92	8	1,445	
Ditto	10 15	12	„	20	Nil.	32	Nil.	46	2	66	6	1,321	
Ditto	10 6	10	„	18	„	24	„	38	2	68	6	1,345	
Averages (Irish)	10 15	12·0	Nil.	24·0	0·7	34·0	1·3	50·7	3·3	75·3	6·7	1,370	1,841
GRAND AVERAGE (British)	9 15	15·2	Nil.	31·5	0·3	48·9	2	75·5	4·5	–	–	1,266	1,701

REMARKS.—In all cases the arms were, as far as possible, bored in such a direction that the insulator-bolt hole was at right angles to the medullary rays.

The temporary sets were measured after the loads had been supported for one minute, and the permanent sets one minute after the loads had been removed.

TABLE II.

CANTILEVER TESTS OF OAK ARMS.

FOREIGN.

$K = \frac{WL}{BD^2}$

W = Load in lbs. at collapse.

L = Leverage in inches (21 inches in all cases).

B and D = breadth and depth of section in inches (2½ inches in all cases).

DISTRICT.	Weight of Arm.	Set (in 64ths of an inch) with load of (lbs.).										W.	K.
		224		448		672		896		1,120			
		Temporary.	Permanent.	Temporary.	Permanent.	Temporary.	Permanent.	Temporary.	Permanent.	Temporary.	Permanent.		
	lb. oz.												
South Russia	11 4	8	nil	16	1	32	2	44	4	64	6	1,714	—
Ditto	7 13	12	„	28	2	48	8	72	16	—	—	1,129	—
Ditto	10 5	28	„	36	nil	48	4	80	8	120	12	1,254	—
Ditto	10 0	6	„	12	„	40	2	56	4	96	16	1,926	—
Ditto	8 0	16	„	32	„	50	2	70	4	—	—	1,084	—
Ditto	8 1	16	„	38	2	62	4	92	6	—	—	1,120	—
Ditto	9 8	14	„	34	nil	58	2	92	4	—	—	1,120	—
Averages	9 4	14·3	nil	28	0·7	48·3	3·4	72·3	6·6	—	—	1,335	1,794
Stettin	8 8	26	nil	56	2	95	5	140	22	—	—	985	—
Ditto	8 12	24	„	40	2	78	6	—	—	—	—	896	—
Ditto	7 14	24	„	44	nil	68	2	—	—	—	—	896	—
Ditto	8 4	20	„	40	2	70	6	96	8	—	—	1,120	—
Ditto	8 3	24	„	38	nil	56	2	78	6	120	12	1,120	—
Averages	8 5	23·6	nil	43·6	1·1	73·4	4·2	104·6	12	—	—	1,055	1,418
Hungary	9 15	16	nil	40	4	64	6	108	10	—	—	963	—
Ditto	7 12	18	„	46	2	76	6	114	8	—	—	902	—
Averages	8 13	17	nil	43	3	70	6	111	9	—	—	932	1,253
West Virginia	7 13	8	nil	30	nil	56	2	90	4	—	—	952	—
Ditto	9 4	10	„	28	„	50	2	66	4	92	6	1,366	—
American Red	8 7	10	„	30	„	48	2	72	4	116	8	1,261	—
American Oak	7 2	16	„	32	„	64	2	118	12	—	—	1,036	—
American (Source unknown.)	8 0	12	„	30	„	52	1	86	2	—	—	1,120	—
Averages	8 2	11·2	nil	30	nil	54	1·8	86·4	5·2	—	—	1,147	1,542
Grand Average (Foreign)	8 11	16·1	nil	34·2	0·8	58·6	3·4	86·7	6·8	—	—	1,169	1,571

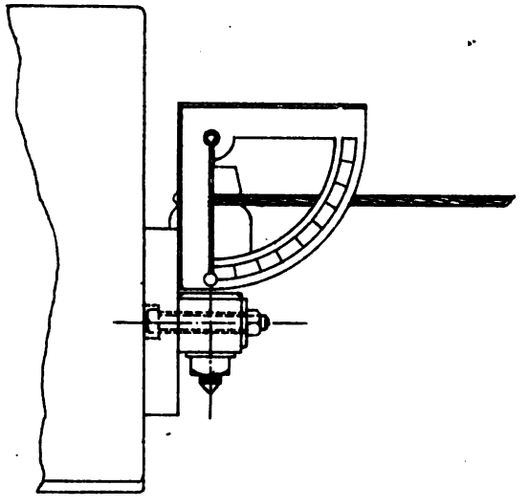
REMARKS.—In all cases the arms were, as far as possible, bored in such a direction that the insulator-bolt hole was at right angles to the medullary rays.

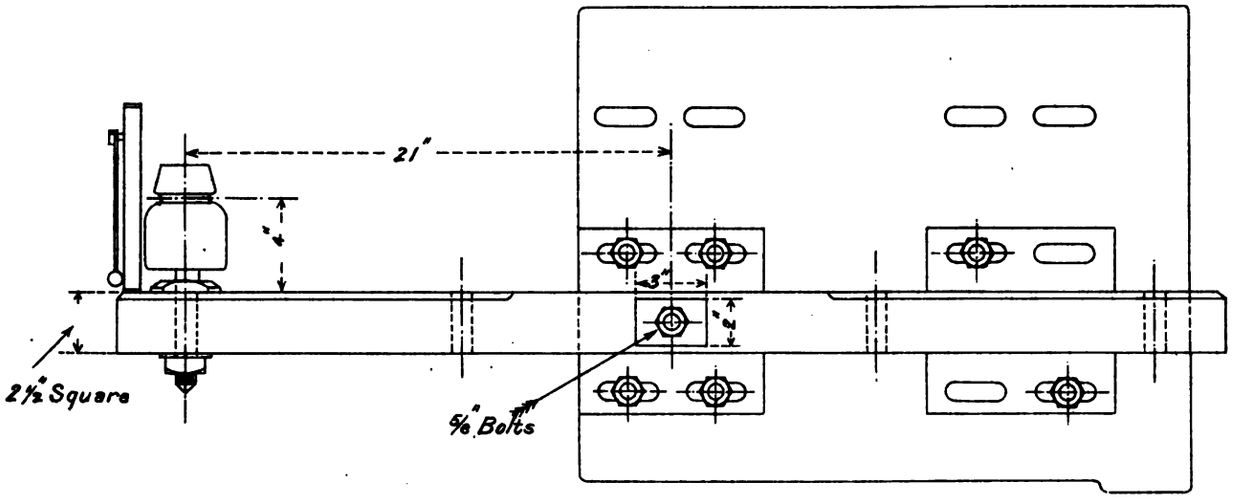
The temporary sets were measured after the loads had been supported for one minute, and the permanent sets one minute after the loads had been removed.

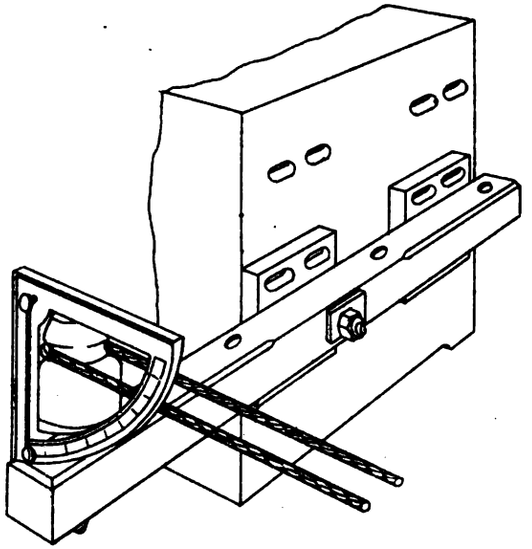
GRAND AVERAGE (British)	10	2	1·3	Nil	2·8	Nil	4·2	·2	5·7	·4	7·6	·9	9·6	1·2	966	

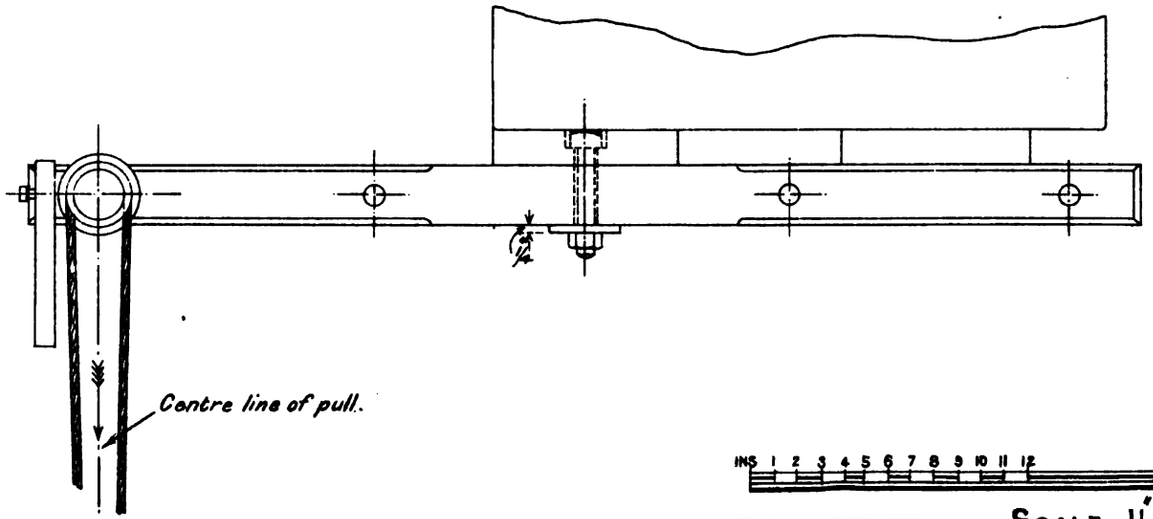
REMARKS.—In all cases the arms were, as far as possible, bored in such a direction that the insulator bolt-hole was at right angles to the medullary rays.
The temporary sets were measured after the loads had been supported for one minute, and the permanent sets one minute after the loads had been removed.

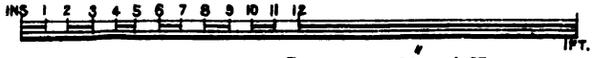
DIAGRAM II.











PART VIEW OF TESTING MACHINE SHOWING TORSION TEST FOR OAK ARMS. SCALE 1½" = 1 FOOT.

3488. 9. 02.

E. Weller & Grahams, LM Litho, London.

TABLE III.

OAK: COMBINED TORSIONAL AND SPLITTING TEST.

NATIVE.

COUNTY IN WHICH TIMBER WAS GROWN.	Weight of Arm.	Set (in Degrees) with Load of (Lbs.)												Load at which Arm fractured.
		112.		224.		336.		448.		560.		672.		
		Temporary.	Permanent.	Temporary.	Permanent.	Temporary.	Permanent.	Temporary.	Permanent.	Temporary.	Permanent.	Temporary.	Permanent.	
	Lbs. oz.													*Lbs.*
Cumberland	11 4	1	Nil	2½	Nil	4	1½	5½	2	7	3	9	4	986
Gloucestershire	11 6	1⅝	,,	3½	,,	4½	Nil	5½	Nil	7½	Nil	—	—	672
Ditto	10 8	1½	,,	2⅝	,,	4½	,,	6	,,	8½	¼	10½	½	733
Worcestershire	9 8	½	,,	3	,,	4½	,,	6	,,	8½	Nil	11	½	880
Ditto	9 7	1½	,,	3	,,	5	,,	7	,,	10	½	13	1¼	889
Surrey	9 10	1½	,,	3	,,	3½	,,	5½	,,	7½	Nil	8½	½	772
Hants	11 10	2	,,	3½	,,	5	,,	6	¼	7	½	9½	½	907
Averages (English)	10 8	1·4	Nil	3	Nil	4·4	·2	5·9	·3	8	·6	10·1	1	834
Stirlingshire	—	½	Nil	1⅝	Nil	3	½	4½	⅜	5½	⅞	7	1	1,086
Perthshire	7 13	1	,,	1½	,,	3	Nil	4	Nil	5½	Nil	7	Nil	974
Ditto	8 9	1⅝	,,	3½	,,	5	,,	6½	,,	8	½	11	1	956
Averages (Scottish)	8 3	1	Nil	2·2	Nil	3·6	·1	5	·25	6·3	·4	8·3	·6	1,005
Louth	11 12	1½	Nil	3	½	4½	1	6	1½	8½	2¼	10	3	1,576
Ditto	11 3	1½	,,	3½	½	5½	1	8	1½	10½	2	13	3½	863
Ditto	9 2	1½	,,	3½	Nil	4½	Nil	6	⅜	7	½	8½	1	927
Ditto	9 11	1	,,	2	,,	3	,,	4½	Nil	5½	Nil	7	Nil	1,299
Averages (Irish)	10 7	1·3	Nil	3	·25	4·3	·5	6·1	·8	7·8	1	9·6	1·8	1,166
GRAND AVERAGE (British)	10 2	1·3	Nil	2·8	Nil	4·2	·2	5·7	·4	7·6	·9	9·6	1·2	966

REMARKS.—In all cases the arms were, as far as possible, bored in such a direction that the insulator bolt-hole was at right angles to the medullary rays.
The temporary sets were measured after the loads had been supported for one minute, and the permanent sets one minute after the loads had been removed.

TABLE IV.

OAK: COMBINED TORSIONAL AND SPLITTING TEST.

FOREIGN.

DISTRICT.	Weight of Arm.	Set (in Degrees) with Load of (Lbs.)												Load at which Arm fractured.
		112.		224.		336.		448.		560.		672.		
		Temporary.	Permanent.	Temporary.	Permanent.	Temporary.	Permanent.	Temporary.	Permanent.	Temporary.	Permanent.	Temporary.	Permanent.	
	Lbs. ozs.													Lbs.
South Russia	8 5	1	Nil	3	Nil	4	Nil	6	½	8½	1	—	—	604
Ditto	8 12	2	,,	3½	,,	5	,,	7	½	9½	1	—	—	681
Ditto	10 4	½	,,	2	,,	3½	½	6	½	8½	1	—	—	616
Ditto	10 12	½	,,	2½	,,	4	½	5½	½	6½	½	10	1½	862
Ditto	8 11	1½	,,	2	,,	3½	Nil	4¾	¼	6	½	7	¾	994
Ditto	8 12	1½	,,	3	,,	5	,,	6¾	¼	10	1	16½	3	728
Ditto	7 10	1¼	,,	2½	,,	4	,,	5¾	¼	7	½	10½	1	806
Averages	9 0	1·1	Nil	2·6	Nil	4·1	·1	5·9	·4	8	·7	—	—	756
Stettin	9 0	1½	Nil	3	Nil	5	Nil	6½	½	9	1	13	1¾	728
Ditto	8 8	1½	,,	3½	,,	5½	,,	7½	½	14	1¾	—	—	649
Ditto	8 8	1¾	,,	3¾	,,	5	,,	7	½	9	½	10½	1	873
Ditto	7 15	1¾	,,	3½	,,	5	,,	6½	Nil	9½	1	11½	1½	761
Ditto	7 13	1½	,,	3	,,	4½	,,	6	¼	7½	½	9½	1	873
Ditto	7 7	2	,,	3½	,,	6	,,	8	¼	10	¾	13½	1½	683
Ditto	7 6	2	,,	3½	,,	5	,,	7½	½	9½	1	11½	1¼	784
Averages	8 1	1·7	Nil	3·4	Nil	5·1	Nil	7	·3	9·7	·9	11·5	1·3	764
Hungary	9 2	1	Nil	2½	¼	4½	1	6	2	—	—	—	—	649
Ditto	8 0	1	,,	2½	Nil	3½	½	5	1	—	—	—	—	802
Averages	8 9	1	Nil	2½	·1	3·8	·75	5·5	1·5	—	—	—	—	725
West Virginia	9 2	1	Nil	2	Nil	6	½	6	½	8	1	12½	2	784
Ditto	7 0	1	,,	2½	,,	6	Nil	6	Nil	—	—	—	—	593
American Red Oak (Source unknown)	8 11	¾	,,	1½	,,	3	,,	4	,,	5½	¼	6½	½	1,180
Ditto - ditto - (Source unknown)	8 2	1½	,,	2¼	,,	4	,,	6	,,	7½	Nil	10	½	705
Ditto - ditto - (Source unknown)	8 8	1½	,,	3	,,	4½	,,	5½	,,	7	¼	8½	½	806
Averages	8 5	1·1	Nil	2·2	Nil	4·7	·1	5·5	·1	7	·3	9·3	·8	813
GRAND AVERAGES (FOREIGN)	8 7	1·3	Nil	2·7	Nil	4·5	·1	6·1	·4	8·4	·7	—	—	770

REMARKS.—In all cases the arms were, as far as possible, bored in such direction that the insulator-bolt hole was at right angles to the medullary rays.
The temporary sets were measured after the loads had been supported for one minute, and the permanent sets one minute after the loads had been removed.

DIAGRAM III.

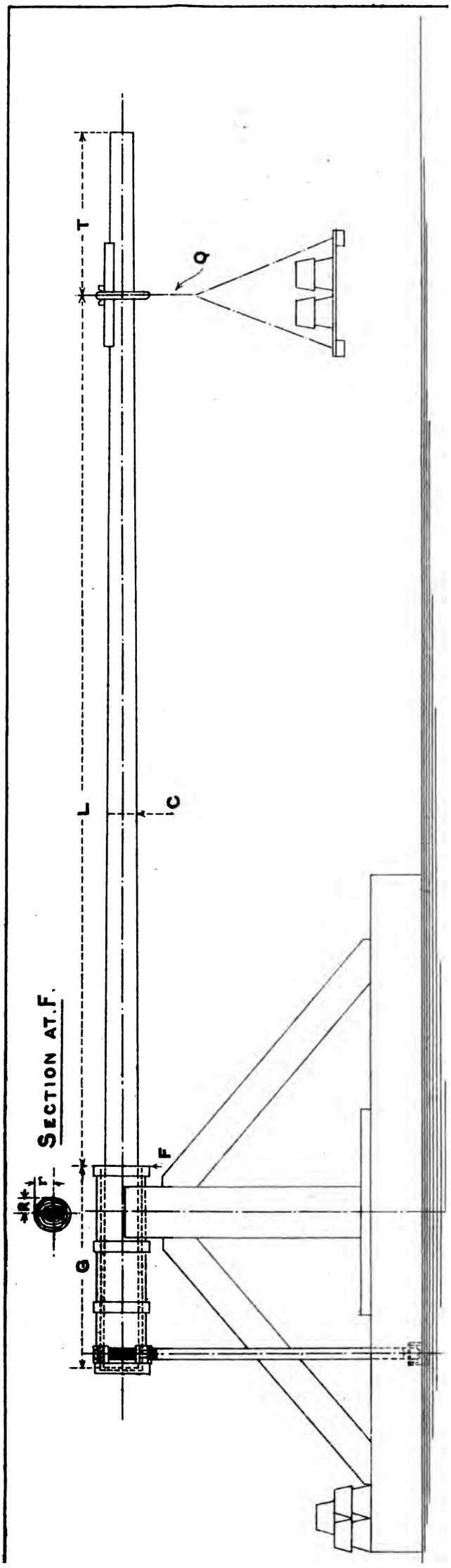


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TABLE IV.

OAK: COMBINED TORSIONAL AND SPLITTING TEST.

FOREIGN.

Weight	Set (in Degrees) with Load of (Lbs.)						Load at which

Appendix XVIII.

POST OFFICE TELEGRAPHS.

OAK SCANTLING.

Specification referred to in the accompanying form of tender, No.

(1) The scantling shall be sawn from good strong English or Irish oak of large size.

The person tendering shall here name the district, or districts, in which the oak he will supply has been grown.....*

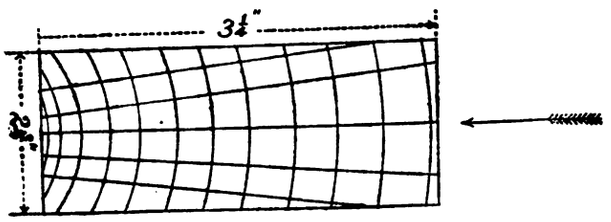
(2) The timber shall be winter-felled, unless otherwise agreed.

The person tendering shall here state when the timber he will supply was, or will be, felled .....*

(3) The timber shall be planked and open-stacked, for seasoning, at least three months before being sawn into scantling.

(4) The scantling shall be cut with the grain of the timber running parallel with the length, and shall be of sound timbers, free from dead wood, sap-wood, the centre pith of the tree, sun-shakes, seasoning shakes, and from such knots as would impair its strength. It shall not be bent or warped.

In the case of scantling 3¼in. by 2¾in. section, it is preferred that it should be cut with the medullary rays running through the timber parallel with the sides of greatest width, *vide* sketch:—



(5) Samples of the oak tendered for, showing the character of the scantling as regards the quality of the wood and its freedom from defects, will be required before an order is issued; and, if approved, these samples will be taken as the standard, for comparison with the supply.

(6) The scantling shall be of one of the sizes shown in the schedule attached to the form of tender, and shall not leave the saw more than 1-16in. under those sizes. Scantling more than 1-16in. under the specified size will be rejected, or will be accepted as, and at the price quoted for, the next smaller size, if any smaller size be due under the order.

(7) On no account shall the ends of scantling be painted. The person tendering shall stamp (not paint) the end of each piece of scantling either with the initials of his firm, or with some other identifying mark.

He shall here state what are the initials, or other identifying mark, to be so stamped.....*

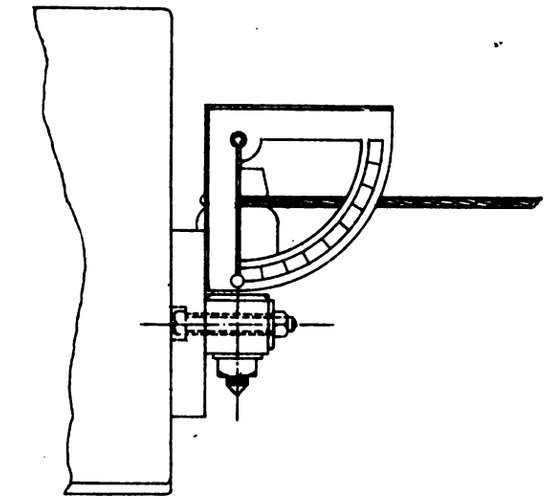
Signature of person tendering .....

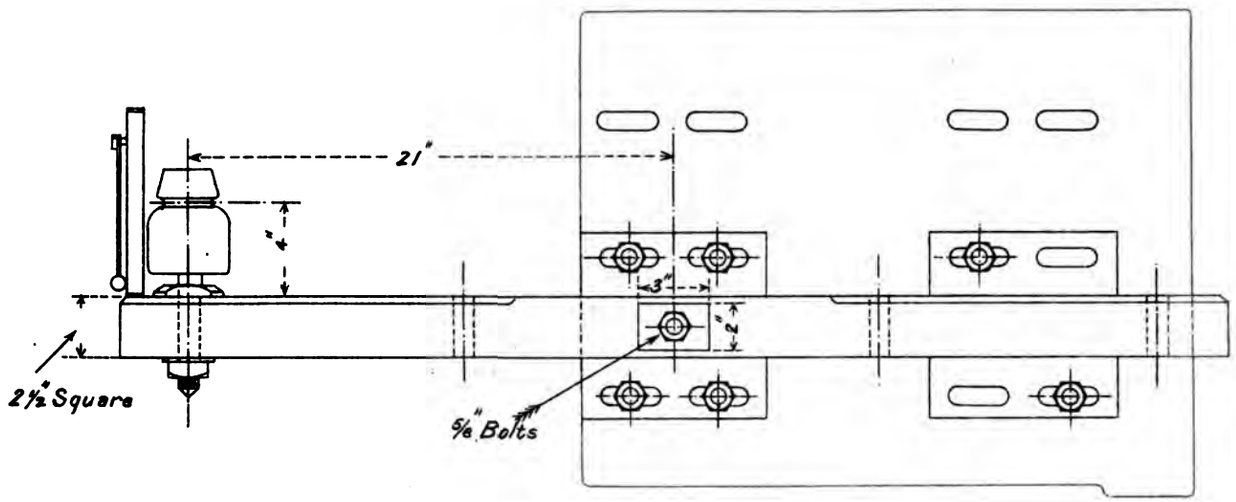
Date ..... 190....

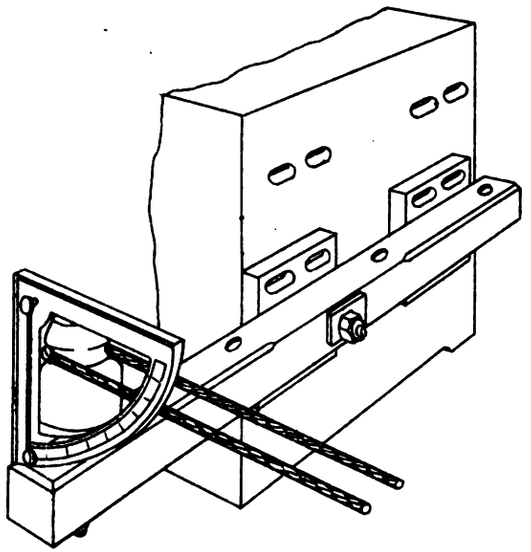
General Post Office, London,
January, 1901.

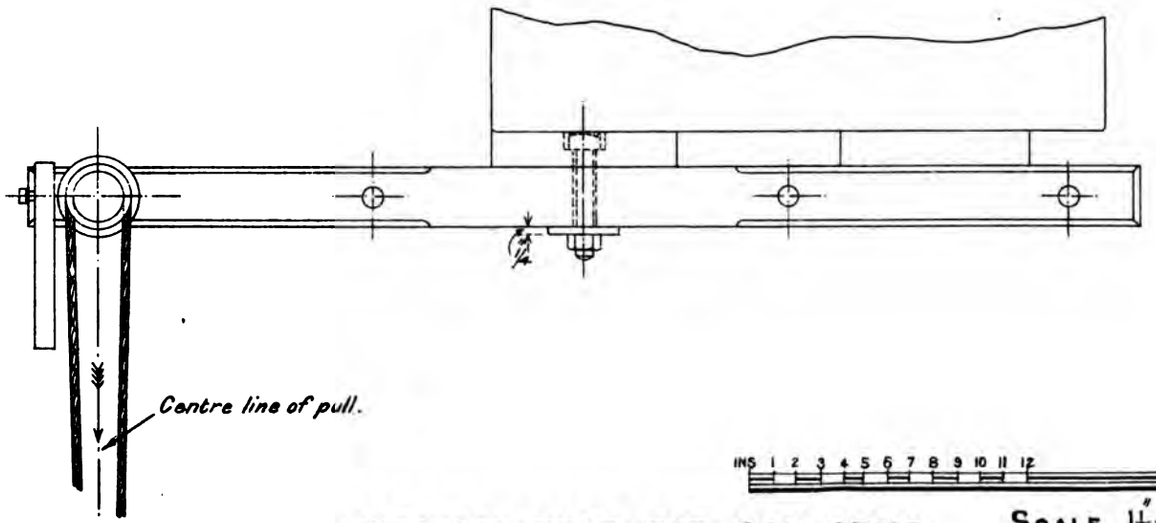
N.B.—Persons who have not previously tendered for oak scantling are informed that, on application to the Superintendent of the Postal Telegraph Factory, Mount Pleasant, London, E.C., they will be shown the scantling in stock, that they may thereby acquaint themselves with the standard of quality required by the Department.

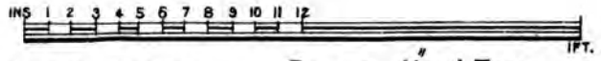
DIAGRAM II.











PART VIEW OF TESTING MACHINE SHOWING TORSION TEST FOR OAK ARMS.

SCALE 1½" = 1 FOOT.

3466. 3. 02.

E. Weller & Grahams, Ltd. Litho. London.

TABLE III.

OAK: COMBINED TORSIONAL AND SPLITTING TEST.

NATIVE.

COUNTY IN WHICH TIMBER WAS GROWN.	Weight of Arm.	Set (in Degrees) with Load of (Lbs.)												Load at which Arm fractured.
		112.		224.		336.		448.		560.		672.		
		Temporary.	Permanent.	Temporary.	Permanent.	Temporary.	Permanent.	Temporary.	Permanent.	Temporary.	Permanent.	Temporary.	Permanent.	
	Lbs. oz.													*Lbs.*
Cumberland	11 4	1	Nil	2½	Nil	4	1½	5½	2	7	3	9	4	986
Gloucestershire	11 6	1⅝	,,	3½	,,	4½	Nil	5½	Nil	7½	Nil	—	—	672
Ditto	10 8	1¼	,,	2¾	,,	4½	,,	6	,,	8½	¼	10½	½	733
Worcestershire	9 8	½	,,	3	,,	4½	,,	6	,,	8½	Nil	11	½	880
Ditto	9 7	1½	,,	3	,,	5	,,	7	,,	10	½	13	1¼	889
Surrey	9 10	1½	,,	3	,,	3½	,,	5½	,,	7½	Nil	8½	½	772
Hants	11 10	2	,,	3½	,,	5	,,	6	¼	7	½	9½	½	907
Averages (English)	10 8	1·4	Nil	3	Nil	4·4	·2	5·9	·3	8	·6	10·1	1	834
Stirlingshire	—	½	Nil	1¾	Nil	3	½	4½	¾	5½	⅞	7	1	1,086
Perthshire	7 13	1	,,	1½	,,	3	Nil	4	Nil	5½	Nil	7	Nil	974
Ditto	8 9	1⅜	,,	3½	,,	5	,,	6½	,,	8	½	11	1	956
Averages (Scottish)	8 3	1	Nil	2·2	Nil	3·6	·1	5	·25	6·3	·4	8·3	·6	1,005
Louth	11 12	1½	Nil	3	½	4½	1	6	1½	8½	2¼	10	3	1,576
Ditto	11 3	1½	,,	3½	½	5¼	1	8	1½	10½	2	13	3½	863
Ditto	9 2	1½	,,	3½	Nil	4½	Nil	6	½	7	½	8½	1	927
Ditto	9 11	1	,,	2	,,	3	,,	4½	Nil	5½	Nil	7	Nil	1,299
Averages (Irish)	10 7	1·3	Nil	3	·25	4·3	·5	6·1	·8	7·8	1	9·6	1·8	1,166
GRAND AVERAGE (British)	10 2	1·3	Nil	2·8	Nil	4·2	·2	5·7	·4	7·6	·9	9·6	1·2	966

REMARKS.—In all cases the arms were, as far as possible, bored in such a direction that the insulator bolt-hole was at right angles to the medullary rays.
The temporary sets were measured after the loads had been supported for one minute, and the permanent sets one minute after the loads had been removed.

TABLE IV.

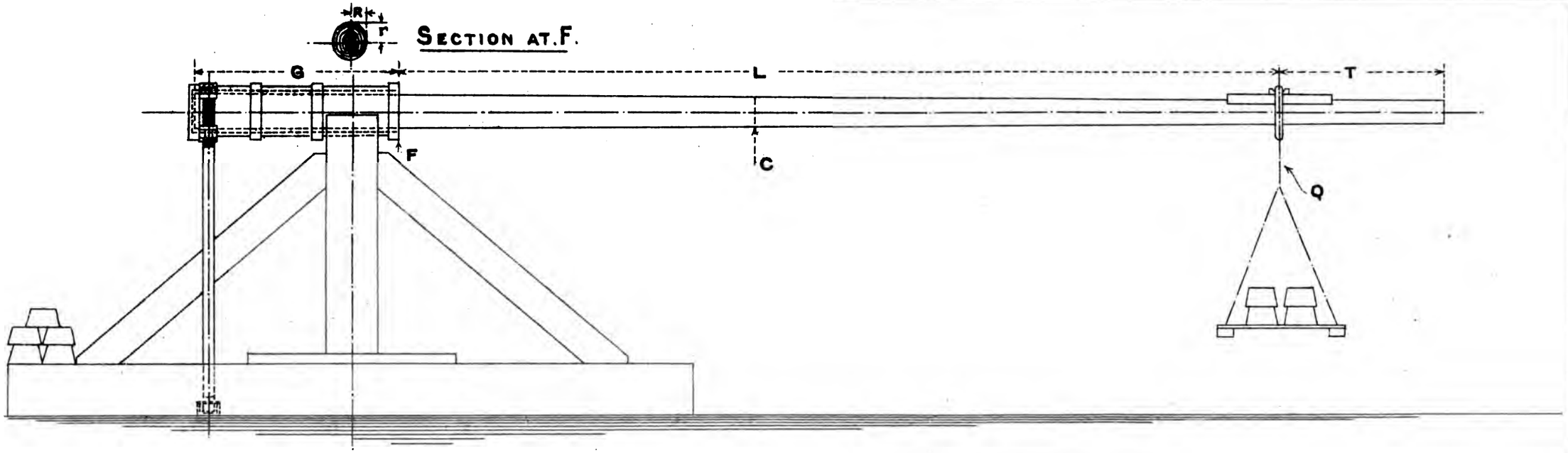
OAK : COMBINED TORSIONAL AND SPLITTING TEST.

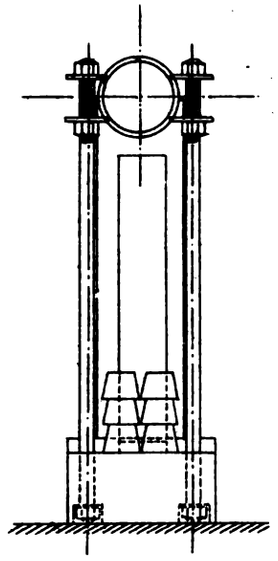
FOREIGN.

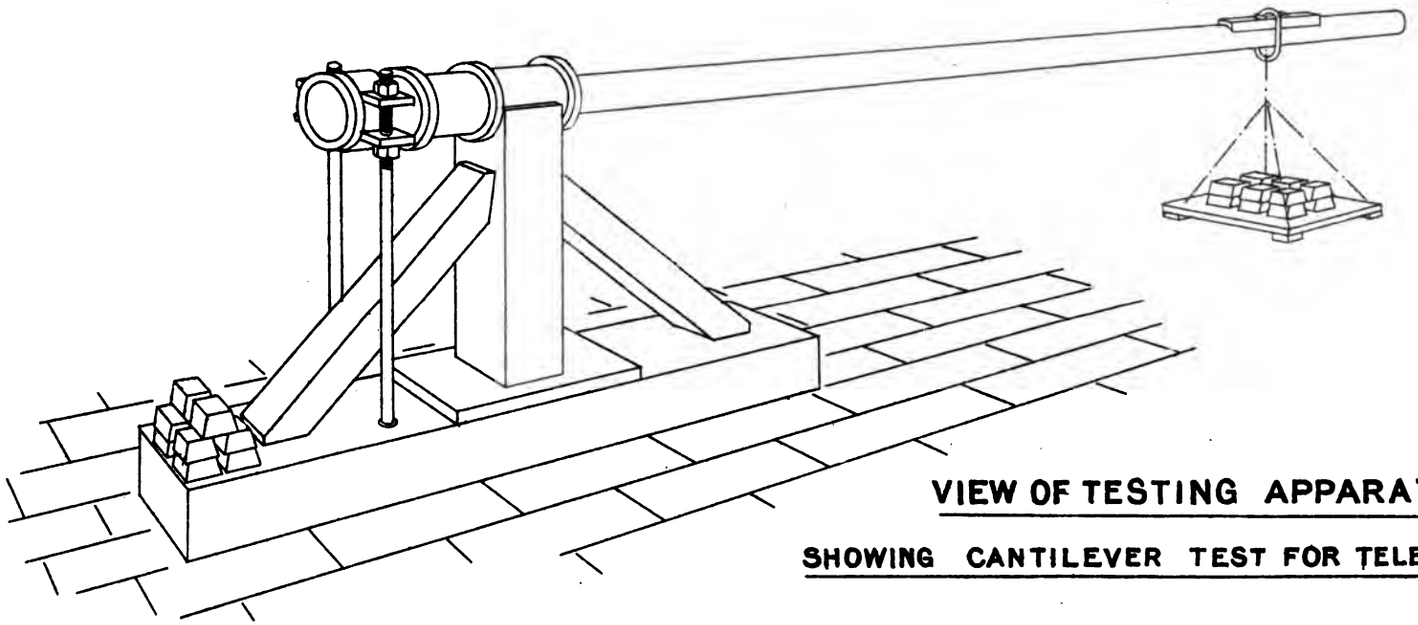
DISTRICT.	Weight of Arm.	Set (in Degrees) with Load of (Lbs.)												Load at which Arm fractured.
		112.		224.		336.		448.		560.		672.		
		Temporary.	Permanent.	Temporary.	Permanent.	Temporary.	Permanent.	Temporary.	Permanent.	Temporary.	Permanent.	Temporary.	Permanent.	
	Lbs. ozs.													Lbs.
South Russia	8 5	1	Nil	3	Nil	4	Nil	6	½	8½	1	—	—	604
Ditto	8 12	2	,,	3½	,,	5	,,	7	½	9½	1	—	—	681
Ditto	10 4	½	,,	2	,,	3½	½	6	½	8½	1	—	—	616
Ditto	10 12	½	,,	2½	,,	4	½	5½	½	6½	½	10	1½	862
Ditto	8 11	1½	,,	2	,,	3½	Nil	4½	¼	6	½	7	¾	994
Ditto	8 12	1½	,,	3	,,	5	,,	6¾	¼	10	1	16½	3	728
Ditto	7 10	1¼	,,	2½	,,	4	,,	5¾	¼	7	½	10½	1	806
Averages	9 0	1·1	Nil	2·6	Nil	4·1	·1	5·9	·4	8	·7	—	—	756
Stettin	9 0	1½	Nil	3	Nil	5	Nil	6½	½	9	1	13	1¾	728
Ditto	8 8	1½	,,	3½	,,	5½	,,	7½	½	14	1¾	—	—	649
Ditto	8 8	1¾	,,	3¾	,,	5	,,	7	¼	9	½	10½	1	873
Ditto	7 15	1¾	,,	3½	,,	5	,,	6½	Nil	9½	1	11½	1½	761
Ditto	7 13	1½	,,	3	,,	4½	,,	6	¼	7½	½	9½	1	873
Ditto	7 7	2	,,	3½	,,	6	,,	8	¼	10	¾	13½	1½	683
Ditto	7 6	2	,,	3½	,,	5	,,	7½	½	9½	1	11½	1¼	784
Averages	8 1	1·7	Nil	3·4	Nil	5·1	Nil	7	·3	9·7	·9	11·5	1·3	764
Hungary	9 2	1	Nil	2½	¼	4¼	1	6	2	—	—	—	—	649
Ditto	8 0	1	,,	2½	Nil	3½	½	5	1	—	—	—	—	802
Averages	8 9	1	Nil	2½	·1	3·8	·75	5·5	1·5	—	—	—	—	725
West Virginia	9 2	1	Nil	2	Nil	6	½	6	½	8	1	12½	2	784
Ditto	7 0	1	,,	2½	,,	6	Nil	6	Nil	—	—	—	—	593
American Red Oak (Source unknown)	8 11	¾	,,	1½	,,	3	,,	4	,,	5½	¼	6½	½	1,180
Ditto - ditto - (Source unknown)	8 2	1½	,,	2¼	,,	4	,,	6	,,	7½	Nil	10	½	705
Ditto - ditto - (Source unknown)	8 8	1½	,,	3	,,	4½	,,	5½	,,	7	¼	8½	½	806
Averages	8 5	1·1	Nil	2·2	Nil	4·7	·1	5·5	·1	7	·3	9·3	·8	813
GRAND AVERAGES (FOREIGN)	8 7	1·3	Nil	2·7	Nil	4·5	·1	6·1	·4	8·4	·7	—	—	770

REMARKS.—In all cases the arms were, as far as possible, bored in such direction that the insulator-bolt hole was at right angles to the medullary rays.
The temporary sets were measured after the loads had been supported for one minute, and the permanent sets one minute after the loads had been removed.

DIAGRAM III.







VIEW OF TESTING APPARATUS

SHOWING CANTILEVER TEST FOR TELEGRAPH POLES.

TABLE IX.

For formula for K., *see* Table V.

TESTS OF THREE UNCREOSOTED NORWEGIAN FIR POLES, MAY 1885.

Pole.			G	L.	T.	Section at F.		M.	C.	W.	K.	Average K.	Remarks.
Length.		Class.	Weight.										
						R.	r.			Breaking Weight.			
Ft.	In.		Lbs.	Inches.	Inches.	Inches.	Inches.	Inches.	Cubic feet.	Inches.	Lbs.			
29	7	Stout	35·27	66·5	247	41·5	4·8	4·6	8·08	113	2,217	1,099·31		Sound, hard wood. Fracture 31½ inches from F.
30	0	ditto	34·06	66	252·5	41·5	4·5	4·25	7·72	122	2,022	1,262·20	1,231·62	Fracture 2 feet from F.
29	10½	ditto	39·97	66	251	41·5	4·3	4·25	7·58	124	1,962	1,333·36		Fracture 6 feet from F.

TABLE X.

TESTS OF THREE UNCREOSOTED SCOTCH FIR POLES, 1894 TO 1895.

For formula for K., *see* Table V.

Pole.			G	L.	T.	Section at F.		C.	W.	K.	Average K.	Remarks.
Length.		Class.	Weight.									
						R.	r.		Breaking Weight.			
Ft.	ns.		Lbs.	Inches.	Inches.	Inches.	Inches.	Inches.	Lbs.			
28	2	Medium	426	60	237	41	4·06	3·75	125	1,501	1224·46		Banffshire pole. Fracture through centre.
30	1½	ditto -	437	60	260·5	4	4·75	4·625	138·8	1,930	1025·10	998·15	Fracture 18 inches from F. Forfarshire pole.
30	4½	ditto -	390	60	263·5	41	4·75	4·50	137	1,349	744·89		Forfarshire pole. Fracture six inches from F.

Appendix XIX.

APPENDIX, No. XIX.

MEMORANDUM PREPARED BY THE LOCAL GOVERNMENT BOARD.

Statement of the statutory provisions dealing with the rating to the Poor Rate and other Local Rates of Woodlands in England and Wales.

(1) *The Poor Rate.*

Rating of saleable underwoods.

The authority for the levy of the poor rate is derived from Section 1 of the Poor Relief Act, 1601 (43 Eliz., c. 2). That statute authorised the taxation by the overseers of every inhabitant, parson, vicar, and other, and of every occupier of lands, houses, tithes impropriate or propriations of tithes, coal mines, or saleable underwoods, in the parish for which the rate was made.

The statute of Elizabeth authorised the rating of the underwood itself, and it appears to have been considered that land upon which saleable underwood grew was not assessable to the poor rate. The express mention of saleable underwoods in the statute was also held to imply that wood not within this term was exempt from the poor rate. Thus in "Rex *v.* Inhabitants of Minchinhampton" (1762), 3 Burr, 1309-12, it was held that beech being timber according to the custom of the place in which the question arose was not rateable, and in "Rex *v.* Inhabitants of Ferrybridge" (1823), 1 B. and C., 375 firs and larches planted with oaks for the purpose of sheltering the latter, and cut as the oaks grew larger, were considered to be similarly exempt.

Rating of plantations, woods, &c.

But by Section 14 of the Rating Act, 1874 (37 and 38 Vict., c. 54), so much of the statute of Elizabeth as related to the taxation of an occupier of saleable underwoods was repealed, and by Section 3 of the Act, the statute of Elizabeth, and the Acts amending the same, were extended to land used for a plantation or a wood or for the growth of saleable underwood, and not subject to any right of common.

Under this enactment it is the land, and not the timber, underwood, or other produce of the land, which is made the subject of assessment, and it would seem that if land used as a plantation or a wood or for the growth of saleable underwood is subject to common rights, it is exempt from the poor rate and other local rates.

Mode of valuing woodlands.

The method of estimating the gross estimated rental and rateable value of such woodlands is prescribed by Section 4 of the Act, and is as follows:—

"(a) If the land is used only for a plantation or a "wood, the value shall be estimated as if the land "instead of being a plantation or a wood were let "and occupied in its natural and unimproved state.

"(b) If the land is used for the growth of sale- "able underwood, the value shall be estimated as if "the land were let for that purpose.

"(c) If the land is used both for a plantation or "a wood and for the growth of saleable underwood, "the value shall be estimated either as if the land "were used only for a plantation or a wood, or as "if the land were used only for the growth of the "saleable underwood growing thereon as the assess- "ment committee" (or where there is no assessment committee the persons making the poor rate) "may "determine."

A copy of a circular letter which the Board on the 24th November, 1874, addressed to assessment committees in England and Wales, drawing their attention to the principles which would govern the assessment of the various kinds of property made subject to local rates by the Rating Act, 1874, is appended.

Since the date of this circular two decisions have been given by the Queen's Bench Division of the High Court upon the construction of Section 4 of the Act of 1874. In the case of the "Earl of Westmorland *v.* Southwick and Oundle," (1877), 36 L.T. n.s. 108; 41 J.P. 231, it was decided that in ascertaining the rateable value of a plantation or wood as "land let and occupied in its natural and unimproved state," it was not admissible to base the estimate upon the rent which a hypothetical tenant would give after expenditure had been laid out in grubbing up woods, in draining and fencing and in making roads. In the case of "Eyton *v.* Mold Churchwardens and Overseers" (1880), L.R. 6 Q.B.D. 13, 50 L.J.M.C., 39; 43 L.T. 472, it was held that the value of a right of sporting over land might properly be included in estimating the rateable value of a plantation or wood as land in its natural and unimproved state.

Deduction of rate from rent.

Where the rateable value of woodlands was increased by reason of the same being estimated in accordance with Section 4 of the Act of 1874, an occupier under any lease or agreement made before the commencement of the Act (for this purpose, the 6th April, 1875), was empowered to deduct from his rent during the continuance of the lease or agreement any additional sum paid as rates in respect of such increase of rateable value (37 and 38 Vict., c. 54, section 5).

Poor rate payable in full.

Woodlands are not agricultural land within the meaning of the Agricultural Rates Act, 1896, and an occupier of woodlands is liable to pay the full amount in the pound of any poor rate assessed upon him in respect of such property.

(2) *Other Local Rates.*

General district rate, separate rate for special sanitary expenses, lighting rate.

By Section 10 of the Rating Act, 1874, any hereditament made rateable to the poor rate under that Act became subject to all other local rates leviable upon property rateable to the relief of the poor. Woodlands are thus rateable to a general district rate made by a town council or urban district council under Section 210 of the Public Health Act, 1875 (38 and 39 Vict., c. 55), or to any separate rate for special sanitary expenses levied by overseers in a rural parish under Section 230 of the same Act, or to any lighting rate levied in a rural parish under the Lighting and Watching Act, 1833 (3 and 4 Will. IV., c. 90).

In the case of the general district rate an occupier of woodlands is to be assessed on one-fourth part of the rateable value (38 and 39 Vict., c. 55, section 211 (1) (b)). Similarly an occupier of woodlands is to be assessed to a separate rate for special sanitary expenses, where a special assessment is made for the rate, on one-fourth part of the rateable value, or if no special sssessment is made, he pays one-fourth part only of the rate in the pound payable in respect of houses and other property (38 and 39 Vict., c. 55, s. 230).

As regards a lighting rate levied under Section 33 of the Lighting and Watching Act, 1833, it is open to question whether an occupier of woodlands is liable to pay one-third only of the rate in the pound payable by an occupier of houses, buildings, and property other than land (3 and 4 Will. IV., c. 90, s. 33; 37 and 38 Vict., c. 54, ss. 3, 10; Reg. v. Somerset Justices [1858] 22 J.P. 431, 31 L.T. o.s. 215).

The doubt as to the position created by the 37 and 38 Vict., c. 54, in this instance originates in the decision of the House of Lords in the case of "Thursby and Another *v.* The Churchwardens and Overseers of the Parish of Briercliffe with Entwistle" (L.R. 1895 A.C. 32).

Upon the reasoning adopted in that case, it would seem to be arguable that the occupiers would be rateable on the higher scale. But it is possible that a further judicial decision may be needed to settle the doubt.

Public library rate.

Where the Public Libraries Act, 1892, is in force in a rural parish the rate levied to meet the expenses of the library authority is raised by the overseers with and as part of the poor rate, but a person assessed in respect of woodlands to the public library rate is entitled to an allowance of two-thirds of the sum assessed upon him (55 and 56 Vict., c. 53, s. 18).

Separate county rate, school board rate, &c.

The expenses of county councils, school boards, and the expenses of rural district councils chargeable as general expenses under Section 229 of the Public Health Act, 1875, Section 29 of the Local Government Act, 1894, or any other Act, are usually defrayed out of the poor rate, but where part only of a parish is liable to be assessed to meet any of these expenses, a separate rate may be levied by the overseers over the area liable.

A separate borough rate and a watch rate may also be levied in some instances by town councils of boroughs, and separate highway rates are also raised in some boroughs and urban districts.

In the absence of any special provision on the subject in a local Act, an occupier of woodlands would be liable to pay any of the separate rates above referred to, like the poor rate, in full.

Local Government Board,
1902.

Circular Letter to Clerks of Assessment Committees.

THE RATING ACT, 1874.

(37 and 38 Vic., c. 54.)

Local Government Board,
Whitehall, S.W.,
24th November, 1874.

Sir,—I am directed by the Local Government Board to draw the attention of the Assessment Committee to the Rating Act, 1874 (37 and 38 Vict., c. 54), which was passed during the last Session of Parliament, to amend the law respecting the liability and valuation of certain descriptions of property for the purpose of rates.

Although the Act will not come into operation so as to render the property affected by its provisions liable to be actually rated until the 6th day of April, 1875, it will be seen by Section 11 that, for the purpose of enabling any hereditament to be included in a valuation list, which will come into force after that day, the Act takes effect from the date when it passed, viz., the 7th of August, 1874.

In order, therefore, that a proper basis may be provided for the rates to be made during the ensuing parochial year, it is desirable that, in all those cases where new or supplemental valuation lists will be necessary in order to the assessment of any property made rateable by the above-mentioned Act, directions should be forthwith given for the preparation of such lists, in order that their revision may be proceeded with, and that they may be ready for approval as early as practicable after the 6th of April next.

The main object of the Act is to abolish the exemptions from rating which have hitherto existed with respect to the following properties:—

1. Land used for a plantation or a wood.
2. Rights of sporting, when severed from the occupation of the land.
3. Mines other than coal mines.

I.—*As to Plantations and Woods.*

Under the former law (43 Elizabeth, c. 2), saleable underwoods alone, of all descriptions of woods, were rateable; whereas, under the new Act, land used for a plantation or a wood, as well as land used for the growth of saleable underwood, is rendered liable to assessment subject to the exception hereinafter referred to.

It is to be noted that the timber and other trees or shrubs themselves are not made assessable, but the land on which they are growing; and therefore the present statute expressly repeals so much of the 43rd of Elizabeth as relates to the assessment of the occupier of saleable underwood, and imposes the liability in respect of the land on which it is produced.

In dealing therefore, in future with woodland of every kind, the subject in respect of which the assessment is made will be the land itself, and not the underwood, timber, or other trees produced upon it.

The Act classifies this description of property under three heads, viz.:—

1. Land used only as a plantation or a wood.
2. Land used for the growth of saleable underwood.
3. Land used both for a plantation or a wood, and also for the growth of saleable underwood.

1. In the first case, viz., where the land is used only for a plantation or a wood, and not for the growth of saleable underwood, the Act provides that the gross and rateable value (meaning by gross value the gross estimated rental, as defined by the Union Assessment Committee Act, 1862) shall be estimated as if the land, instead of being a plantation or a wood, were let and occupied in its natural and unimproved state.

It will be the duty, therefore, of the Assessment Committee to deal with the land as if it were divested of timber or wood of any description, and to determine its value without taking into account any improvement which has been made, or of which the land might be capable.

It will be observed that the words used are "as if the land, instead of being a plantation or a wood, were let and *occupied* in its natural and unimproved state," and the word "occupied" was introduced in order to show clearly that the capabilities of the land for improvement were to be excluded from consideration in estimating the rent at which it might reasonably be expected to let from year to year, and that the land was to be valued as if it would continue to be occupied in its natural state, without any expenditure of capital in its improvement; or, in other words, as if it were waste land.

It may be useful to state, for the information of the Assessment Committee, that in the Act for the valuation of lands and heritages in Scotland (17 and 18 Vict., c. 91), a somewhat similar enactment is found, as Section 6 of that Act provides that "where lands consist of woods, copse, or underwood, the yearly value of the same shall be taken to be the rent at which such lands might, in their natural state, be reasonably expected to let from year to year as pasture or grazing lands."

2. The second case is that of land used exclusively for the growth of saleable underwood; and the statute requires that in such case the value shall be estimated as if the land were let for that purpose.

It has already been stated that hitherto it has not been the land, but its produce, viz., the saleable underwood, which has been assessable; and although the present Act reverses that rule, and renders the land assessable instead, the mode of arriving at the value will virtually remain the same, as the value of the land can only be arrived at by estimating the value of its produce.

3. With respect to the third case of composite woods, *i.e.*, where the land is used both for a plantation or a wood, and also for the growth of saleable underwood, the value is to be estimated either as if the land were used only for a plantation or a wood, or as if the land were used only for the growth of the saleable underwood growing thereon, as the Assessment Committee may determine.

In this case, therefore, it is entirely within the discretion of the Assessment Committee to adopt either alternative; but it must be borne in mind that if they assess the land as if it were used for the growth of saleable underwood, the land cannot be valued as if it were let for the growth of saleable underwood and capable of improvement for that purpose, but only in respect of the saleable underwood actually growing thereon, irrespective of any capacity for improvement by the removal of trees, or otherwise.

It should be added that woodlands, which are subject to rights of common, are not rendered rateable by the Act.

II.—*As to Rights of Sporting and Fishing.*

The Assessment Committee are aware that under the statute (43 Elizabeth, c. 2) rights of sporting, when severed from the occupation of the land, have not been considered to be assessable. Thus, if the owner let his land, reserving to himself the right of sporting, or let his land to one person and the right of sporting to another, no one according to the general opinion could be rated in respect of such right, although the land itself might be let at a lower rent in consequence of the existence of the right so severed.

Where, however, the occupier of the land, whether as owner or tenant, possessed the right of sporting, and either retained it himself or let it to another person, the Courts held that in estimating the value of the land to the occupier, the value of the right so possessed, or let by him, ought to be taken into account.

In the case of the Queen *v.* the Battle Union, decided in the Court of Queen's Bench in 1866, Chief Justice Cockburn said:—

"The right to take game upon land is an incident to the occupation of the land. If the land is let without any reservation or previous granting of that right, the right follows as a necessary consequence of the right of occupation. If we find that the occupier of the land derives a benefit, whether from taking game himself or from a pecuniary recompense made to him for allowing someone else to take it, it follows, inas-

Appendix XIX.

much as the right to take the game is *ex concessis* merely an element of value, that where the two things are thus united in one person, the right to game must be taken as an element in arriving at the rateable value of the occupation.—L. R. 2, Q. B., 13.

Under the previous law, therefore, although the right itself was in no case separately rated, still, under certain circumstances, it formed an element in estimating the rateable value of the land; but hereafter the right, whenever severed, will be separately rateable, except where the owner retains both the land and the right, or lets the land and retains the right without letting it.

Where the right is not severed, or where the owner retains both the land and the right, or lets them both to one tenant, the owner or occupier will continue to be rateable upon the same principle as heretofore; but, in any other case, the right will be dealt with under section 6 of the new Act.

That section provides that where any right of sporting is severed from the occupation of the land and is not let, and the owner of such right receives rent for the land, the right shall not be separately valued or rated, but the gross and rateable value of the land shall be estimated as if the right were not severed.

It will be seen, therefore, that in the particular case referred to, and which, as the Board believe, represents the ordinary arrangement between landlord and tenant, the right, although severed, will not be valued separately; but, as in the case where the owner retains both the land and the right, the right will simply be considered as an element in arriving at the rateable value of the occupation.

The direction of the statute is that the value of the land shall be estimated *as if the right were not severed.* It would appear, therefore, that in dealing with the right as an element of value, it ought not to be estimated upon any such consideration as that of the rent, which a third person might be found to give for it; but according to its worth, if any, to the occupier of the land, upon the supposition that the right is not severed; or, in other words, that he himself is entitled to exercise the right, without the power of making a profit by letting it.

The effect, therefore, of this provision will be to place those lands which are let with a reservation to the owner of the right of sporting, on the same footing in relation to rateability as the lands which he himself occupies, retaining the right to the game upon them.

Thus, if there should be in the same parish, or union, two farms, one being in the occupation of the owner and another in the occupation of a tenant, the landlord in both cases having the right of sporting and not letting it, the proper course would seem to be to apply the same principle of assessment to the two farms, and to assess that in the occupation of the tenant, so far as the right of sporting constitutes an element of value, upon precisely the same basis as that retained by the owner.

It would, however, be manifestly unjust that, if the rateable value of any property happens to be increased by the addition of the value of the right of sporting, the occupier should have to bear the additional rate in respect of such increase; and, with the view of enabling him to deduct from his rent the additional rate so occasioned, the same section (6) requires the Assessment Committee, on the application of such occupier, to certify in the valuation list, or otherwise, the fact and amount of such increase.

The preceding remarks are mainly directed to those cases where the right of sporting is retained by the owner. Where, however, it is let, it will be rateable as a separate hereditament, and the ordinary rules of law for determining the gross estimated rental and rateable value of other kinds of property will apply.

There may also be some few exceptional cases where the right, although distinct from the ownership of the land, as under a grant of free warren or other special grant or reservation, is of some real and appreciable value, and in these cases also the ordinary principles of assessment will apply.

The foregoing observations relative to the right of sporting are equally applicable to the future assessment of the right of fishing.

* * * *

Miscellaneous Provisions.

The foregoing provisions are those which chiefly affect the duties of the Assessment Committee.

There are others which provide for the deduction of rates under existing contracts, and for the rating of other persons than the occupiers, and to which it will only be necessary to refer very briefly.

Where the rateable value of any woodland is increased by reason of the Act, the occupier under any agreement or lease made before the passing of the Act is enabled to deduct from his rent the additional rate paid by him on any such increase of rateable value, and it will be the duty of the Assessment Committee, on the application of the occupier, to certify the fact and amount of such increase, as in the case where the occupier becomes liable to an increased rate in respect of a right of sporting retained by the owner, and not let.

* * * *

The Act further provides that where a right of sporting is severed from the land and let, either the owner or lessee of the right may, in the discretion of the overseers, be rated for the same.

In like manner the owner of any right of sporting, when severed, although not let, may be rated as the occupier thereof, except as already stated where the owner receives rent for the land over which the right extends.

It is important to observe that in those cases where any person is authorised by the Act to deduct any rate or part of a rate from any rent, royalty, or dues payable by him, the person receiving the rent, royalty, or dues, has the same right of objection and appeal with reference to the valuation list or rate as the occupier.

The Board cannot attempt to do more in a circular letter than point out the principles which will govern the assessment of the several kinds of property now rendered subject to local rates. The application of those principles to individual cases will rest with the Assessment Committee, and the Board entertain no doubt that they will discharge this important and somewhat difficult duty in a careful, considerate, and impartial manner.—I am, Sir, your obedient servant,

To the Clerk to the Assessment Committee.

JOHN LAMBERT, Secretary.

Appendix XX.

APPENDIX, No. XX.

MEMORANDUM BY SIR WILLIAM T. THISELTON-DYER, K.C.M.G., F.R.S., DIRECTOR OF THE ROYAL BOTANIC GARDENS, KEW.

The question divides into two heads: (i.) Forestry in the United Kingdom; (ii.) in the Empire at large

(i.) As regards the United Kingdom, I regard the problem as a purely economic one. Timber is simply a crop, and it will be grown as soon as it can be shown that there is a reasonable prospect of profit.

Dr. Schlich, in whose opinion I have full confidence, considers that the world's supply of timber will be exhausted before that of coal. Already Europe fails to meet its wants by some 3,000,000 tons. The time is probably not very distant when the New World will cease to be able to supply the deficiency. The value of timber has consequently risen in the five-year period, 1895-9, according to Dr. Schlich, by 18 per cent. That any large area of the United Kingdom will be converted into forest is improbable. I do not think, therefore, that there will be any considerable demand at home for trained forest experts. But I think that with the improved price of timber the amount of small woodlands will increase, and that there will be a considerable demand for skilled woodmen in the future. I have no doubt that there is already room for some system of giving such men a better training than they now possess, perhaps on the lines on which journeymen gardeners are trained at Kew.

(ii.) With regard to the Empire at large, the state of things described in my evidence given before the Select Committee in 1885 is rapidly becoming acute. The problem is not one of re-afforestation, but of working on proper principles and preserving from exhaustion forests which already exist. Most of the work connected with it in the Crown Colonies passes through my hands. The only source at present from which trained forest officers can be obtained is the Indian Forest Service. I have recently had to deal with the supply of forest officers to the Straits Settlements, Ceylon, Nigeria, and Trinidad. The system is not wholly regarded with favour by the Government of India, and the incidental difficulties have had in great measure to be overcome by personal influence rather than on strictly official lines. I very much doubt whether it will be possible to strain the resources of the Indian Forest Department much further. Appendix XX.

Indian forest officers are trained at the Indian Civil Engineering School at Cooper's Hill. The system has recently been a good deal criticised, and Sir Dietrich Brandis and myself were requested by the Secretary of State for India to report upon it. In this report we recommended that the service should be recruited in a different manner, and that the school should be removed to Cambridge.

I have no doubt that such a school might serve the colonies, including the self-governing ones as well as India.

W. T. Thiselton-Dyer.

Kew, March 24th 1902.

APPENDIX No. XXI.

Appendix XXI.

HANDED in by Mr. E. STAFFORD HOWARD C.B.

AREAS UNDER WOOD OF CROWN FORESTS IN THE UNITED KINGDOM.

Name of Wood or Forest.	County.	Area in Acres under Wood.
Dean Forest	Gloucester	15,664
High Meadow Woods	„	3,404
Abbotswood Estate	„	524
Tintern Abbey Estate	Monmouth	3,000
New Forest	Hants	23,088*
Alice Holt Woods	„	1,892
Woolmer Forest	„	656
Bere Woods	„	1,420
Parkhurst Woods	„	1,160
Windsor (excluding Great Park)	Berks	10,000
Delamere Woods	Cheshire	2,100
Chopwell Woods	Durham	870
Eltham Woods	Kent	240
Hazelborough and Salcey Woods	Northampton	1,700
Esher Woods	Surrey	840
	TOTAL	66,758

* Only 16,000 acres of this area can be dealt with as woodland by the Crown.

Appendix XXII.

APPENDIX, No. XXII.

REPRESENTATION BY THE UNIVERSITY COURT OF THE UNIVERSITY OF EDINBURGH to the Departmental Committee appointed by the Board of Agriculture to inquire and report as to the present position and future prospects of forestry, &c.

As members of the Committee are aware, forestry has been taught in this University for the past 13 years. But the teaching has been conducted under the grave disadvantage that there are no growing woods within which the lecturer can give practical instruction to his class. And yet such instruction is as essential in sylviculture as in chemistry—the subject cannot be properly taught by means of class-room lectures only. Unfortunately there are no woods within reasonable distance of Edinburgh—indeed, it is doubtful whether any are to be found in Scotland—which have been for a sufficient length of time under scientific management to serve the purpose of practical instruction in economic forestry. Nor is it likely that a model forest of the kind required will ever come into existence on any private estate. Inevitable changes of ownership, following death or sale, and the consequent absence of continuity in management, must act unfavourably on the proper development of forests. It is needless, in short, to expect that the woods on a private estate will be continuously treated in a scientific manner by three or four successive generations of owners. Such being the case, it is much to be desired that Government should make provision for at least one small State forest in Scotland to serve for purposes of practical instruction. Such a forest, being under State control, would not be subject to the unfortunate fluctuations in aim and method which act so detrimentally in the case of the privately-owned woods. While the provision of one or more State forests would be of the greatest advantage from the University's point of view, it would at the same time benefit the country generally, by offering to landowners and others interested in the subject a much-needed object-lesson in modern scientific sylviculture. It is well known that in all the principal forest schools throughout the world, forests are set apart in this way for instructional purposes, the work in them being conducted in such manner as to secure to the fullest extent the efficient training of the students.

It is also the case that the proper prosecution of sylviculture has added greatly to the resources of those countries where it has received due attention. In Germany and France, for example, it has become a great rural industry, and is highly remunerative. According to competent experts there are many waste tracts in Scotland which if afforested would similarly become a source of wealth to our country.

M. C. Taylor,
Secretary, University Court.

University of Edinburgh,
9th June 1902.

Appendix XXIII.

APPENDIX, No. XXIII.

INSTRUCTION IN FORESTRY AT GIESSEN UNIVERSITY.

I.—*Regulations Concerning Academic Membership.*

Academic membership is attained by matriculation. Candidates for admission must possess the leaving certificate of a German gymnasium (or educational institution of similar standing), exception being made in the case of other persons who can supply evidence of scientific training to the satisfaction of the Rector.

The matriculation fee is 20 marks (£1), or 10 marks (10s.) in the case of students who have already attended another university.

Academic membership gives the right of attendance at lectures, and the use of the University institutes* so far as provided by the special regulations of these institutes.

Attendance at individual lectures is also permitted to unmatriculated persons.

Every matriculated student must enter himself for at least one course of lectures (except during the terms when he is preparing for a State or University examination).

II.—*Regulations as to Fees.*

The lecture fee is 8 marks (8s.) per term for one hour weekly, and 3 marks for every hour beyond the first. For such lectures as entail special work (demonstrations) or outlay (excursions) on the part of the teacher, twice the normal fee may be charged. These normal fees do not apply to the use of the institutes. For a second attendance at the same course of lectures, only half the fee is charged, but there is no reduction in the fee for the practical work.

III.—*Library Regulations.*

The University Library is open daily from 9 to 1 and 3 to 6, except Sundays and holidays. During the spring and autumn holidays, and from Christmas to January 1, it is closed in the afternoon. It is open to all students upon delivery of a ticket to the Library and upon observance of the Library rules.

IV.—*Regulations of 13 June, 1900, Concerning University Examination of Candidates for Admission to the Forest Service.*

These examinations are two: a preliminary and a special. The preliminary can be taken at any time, but the candidate must be a matriculated student and have resided in Giessen since his matriculation. The special can only be taken after three years' attendance at a German university or institution of similar standing: candidates must have previously passed the preliminary examination. The fee for the preliminary is 42 marks (£2 2s.), that for the special 36 marks (£1 16s.). Both examinations are held twice a year at the commencement of each session.

The preliminary examination comprises (1) pure mathe-

* "Institute" is a comprehensive term to denote the buildings, apparatus, etc., requisite for instruction in a particular faculty. It is an integral part of the University. Cf. later the definition of the "Forestry Institute."

matics, including algebra, analytical geometry, and the elements of differential and integral calculus; (2) elementary surveying; (3) physics, including mechanics; (4) chemistry and technical chemistry; (5) general botany, forest botany, and forest climatology; (6) geology and forest soils.

The special examination comprises:

(1) Forestry:—

(i.) General knowledge and methods of forestry, including forest history;

(ii.) Special subjects:—(a) Production, comprising forest cultivation, protection (including forest entomology), utilisation of forests and forest technology; (b) Management, comprising forest working plans, valuation, and financial aspects of tree growth; (c) Engineering, comprising the construction of forest roads, forest surveying, forest division, mensuration of timber; (d) Administration, comprising forest economy and economics; (e) Chase and fishing;

(2) Political economy (theoretical economics and outlines of finance);

(3) Agricultural science (especially management of meadows);

(4) General law.

The requisite proficiency in plan-drawing may be tested, as preferred, either in the above examination, or later, when the candidate presents himself for the State examination.

All examinations are both written and *viva voce*. The number of questions in the written examinations is generally 2 to 4 in each subject, and 15 to 20 in forestry. The *viva voce* examinations are public. The marks given are I. (very good), II. (good), III. (sufficient), and IV. (insufficient), and intermediate marks. Candidates obtaining a mark below III. are rejected, and must undergo the whole examination again. As a rule no candidate may try more than three times.

V.—*Regulations for Graduating as Doctor of Philosophy (Ph.D.).*

The following subjects are accepted for a degree:—Philosophy; mathematics; physics; chemistry; mineralogy or geology; botany; zoology; geography; political economy; forestry; agriculture; history; art; and ancient and modern languages. Three of these must be taken, one as a chief subject, and two as subordinates, the selection of the latter being subject to the approval of the authorities. The candidate must present a dissertation in his chief subject, or a work already published may be accepted, and there is a *viva voce* examination in the three subjects. In place of this *viva voce*, the special (forestry) examination will be accepted, provided the candidate obtained a mark above II. (good); the three subjects for the degree must in this case be political economy, forestry, and agriculture.

The fees for the degree amount to 325 marks (£16 5s.).

VI.—*Special Regulations Concerning Forestry Instruction.*

A special two years' course of lectures and practical work is arranged and published by the two professors of forestry. There is no compulsion to attend the whole of these courses. Upon demand every student will be given a half-yearly certificate of his attendance at the lectures and practical work.

The lectures in the summer term last from the end of April till the first half of August; those in the winter term from the first half of October to the first half of March.

The aids to instruction in forestry comprise:—

(a) Collections of objects of natural history (mammals, birds, insects, objects of animal food, plants, seeds, fungi, woods, charcoals, barks, peat, minerals, soils, etc.);

(b) Forest implements, machines, and models;

(c) A library of forestry, partly in the University Library, and partly in the forestry department;

(d) The University experiment station of 16½ acres, with special laboratory and lecture-room.

These together make up the academic "Forestry Institute," which is under the direction of one of the professors of forestry. The other members of the staff comprise an assistant to the professors, the keeper of the arboretum, and his assistant.

The practical instruction is divided between the two professors. The practical work and excursions take place as a rule on Wednesdays (on questions connected with forest management) and Saturdays (on questions connected with forest production). In addition, during Whitsuntide, or immediately after the close of the summer term, a tour of 8 to 14 days is arranged in some interesting forest region under the guidance of one of the professors, who undertake this work in turn.

An area of about 620 acres in the neighbourhood, allotted to the Forestry Institute, offers the students opportunity of practice in "the chase."

Since May, 1882, a forestry research laboratory has been attached to the institute, thereby offering the students opportunity to make themselves acquainted with the conditions and work of such research.

GIESSEN UNIVERSITY:—SCHEME OF LECTURES, &c., IN 1901–3.

(*a*) Dr. Hess's Lectures.

		Hours per week.
Summer, 1901	(1) General and systematic forestry	2
	(2) Sylviculture, with demonstrations	6
	(3) Practical work on Sylviculture	Saturday afternoons.
Winter, 1901–2	(1) Utilisation of forests, with demonstrations	7
	(2) Discussion upon systematic forestry and production.	2
	(3) Practical work on utilisation of forests	Saturday afternoons.
Summer, 1902	(1) Protection of forests, including Forest Entomology, with demonstrations.	8
	(2) Practical work on Sylviculture	Saturday afternoons.
Winter, 1902–3	(1) Forest economics, including forest laws	6
	(2) Forest technology, with demonstrations	3
	(3) Practical work on utilisation of forests	Saturday afternoons.

Appendix XXIII.

(*b*) Dr. Wimmenauer's Lectures.

		Hours per week.
Summer, 1901	(1) Chase and fishing	3
	(2) Valuation of forests	3
	(3) Forest surveying and division	3
	Do. with practical work in the forest	Wednesday afternoons.
Winter, 1901-2	(1) Mensuration of timber	3
	(2) Forest book-keeping, with practical work	2
	(3) Forest working plans according to Hessian methods.	2
	Do. with practical examples	Wednesday afternoons.
	(4) Instruction in drawing plans for foresters and civil servants.	3
Summer, 1902	(1) Construction of forest roads	4
	Do. with practical work in the forest	Wednesday afternoons.
	(2) Forest working plans	4
Winter, 1902-3	(1) Forest administration	2
	(2) Forest history and statistics	2
	(3) Practical work in forest management	2
	Do. with excursions	Wednesday afternoons.
	(4) Instruction in drawing plans for foresters and civil servants.	3

The University Forest Experimental Station at Giessen.

The principal objects of this station (*Forstgarten*) are:—

(1) To give opportunities for demonstration, experiment, and practical instruction in forestry.

(2) To give the students opportunity of studying the botanical characteristics of indigenous and the more important exotic trees.

(3) To supply plants for the station itself and for the practical work of the students, the surplus stock being disposed of amongst the owners of private woodlands and gardens.

(4) To encourage the cultivation of fruit trees and the more important kinds of exotic timber trees.

The plots are necessarily small, in order to exhibit as much variety as possible as regards kind of trees, mixtures, methods of establishing, sowing, and planting of trees, and density of stocking.

The funds for maintaining the experiment and demonstration areas are provided by the State.

The whole area amounts to 6·7066 hectares (16½ acres), of which about 12 acres are actually planted, and 2½ acres are glades, paths, and ditches.

The total area is divided into five sections and 59 sub-sections, some of which are further sub-divided.

The experiment station is partly on the tertiary formation and partly on basalt, so that there is great diversity in the chemical and physical properties of the soil.

The conduct of the principal operations and the supervision of the staff are entrusted to a director, who is one of the University Professors of Forestry. A foreman resides on the premises; he has a fixed salary, free lodging, and 1¼ acres of land for his own use.

The buildings consist of a lecture-room, the director's private room, the overseer's dwelling-house and outbuildings (stabling, barn, and woodshed), and also a laboratory or workshop, which is used for the storage of implements, tools, forestry specimens, seeds, etc.

As already mentioned, the station is divided into five sections. It may be noted that in all cases the outlay incurred on every piece of work (whether for purposes of experiment or demonstration, or not), and any receipts which may have accrued, are minutely recorded.

Section 1 (about 5 acres) is mainly devoted to arboriculture, and thus presents a somewhat park-like appearance; a pond and the buildings are also in this section. It contain 220 species and varieties, some of which have already developed into stately trees. This section is divided into 24 sub-sections. One of these consists of 55-year-old silver firs of good growth, under 15 oaks nearly 150 years old, with a few suppressed Norway spruce. This is an example of under-planting a light tree (the oak) with a shade species (the silver fir). Another sub-section is a mixture of oak, ash, alder, rowan, and sycamore of good growth, with a row of poplars and willows. On the remainder of this section the growth of individual trees is more particularly aimed at, so that number and variety of species is the chief object.

Section 2 (about 3 acres).—One sub-section is devoted to experiments in three different ways of sowing oaks (in rows, patches, and broadcast), partly altogether in the open, partly under side shade, and partly under complete shade, with the view of ultimately comparing their growth. In other sub-sections there have been planted pine, birch, larch, lime, and ash, either pure or mixed, with similar objects. Investigations as to the advantage of pruning oak and lime, and whether grass should be allowed to grow under ash, are also conducted.

Section 3 (about 3½ acres).—This is chiefly planted with silver fir, hornbeam, ash, Norway spruce, alder, and some mixtures. Besides experiments in the method of planting, silver fir and ash are grown with and without grass under them, and experiments in thinning and pruning are carried out in the case of Norway spruce.

Section 4 (about 2½ acres).—The trees here are chiefly Norway spruce, oak, silver fir, black Austrian pine, lime, poplar, willow, and some mixtures. The objects aimed at, besides method of planting in all cases, include the determination of the best time for planting (autumn or spring) thinning and pruning, etc. This section includes also a nursery, examples of fencing, and an artificial hill chiefly planted with mountain pine.

Section 5 (about 2½ acres).—This section is attached to the Forest-research Laboratory, and is devoted partly to the raising of exotic trees, and partly to their cultivation in the open. The general conditions of their growth are observed, and they are also used for demonstration purposes. The varieties mostly grown here are Weymouth pine, Californian maple, Douglas pine, Sitka spruce, Nordmann's pine, Corsican pine, white hickory, and black walnut.

The enclosure of the whole station has formed the object of experiment. It is surrounded partly by hedge and partly by fence. Where the fence occurs the posts consist of twelve different kinds of wood—larch, silver fir, Norway spruce, Scots fir, Weymouth pine, black Austrian pine, oak, beech, ash, alder, acacia, white beam. Observations are made on the durability of the various species, and as the posts have been cut from different parts of the stem (butt, middle, top), and have been subjected to varying treatment (charred, tarred, impregnated, painted, etc.), information on these points is also obtained. Different types of paling and various hedge-plants are also being tested.

APPENDIX, No. XXIV.

PROGRAMME AND REGULATIONS OF THE BAVARIAN LOWER SCHOOLS OF FORESTRY (*Waldbauschulen*).

The aim of these schools is to prepare young men for admission to the executive and protective staff of the State forests of the Kingdom. They are intended to give the pupils such a measure of general and technical knowledge as is indispensable for their future calling; and also to further the moral character of the pupil, to accustom him to obedience, punctuality, endurance in labour, and capacity for bodily exertion, and to awake in him a love of his work in the forest.

Each school is established at the headquarters of a forest district, and as regards immediate control is under the Forest-Director of the district. The schools are under the Forestry Department of the Ministry of Finance.

The instruction given comprises: (1) Religion, (2) general subjects (complementary to the education provided in the public elementary schools), viz., writing, German, arithmetic, geography and history, natural science, and drawing; (3) technical instruction. The latter is given partly in the school and partly in the forest.

The technical instruction comprises: (1) Calculation of areas, measurement of the cubic contents of trees, ditches, etc., calculation of the requisite quantities of various plants on given areas, and their distance apart, levelling and measurement of heights of trees with simple instruments; (2) the more important trees and their habit of growth, culture, seeds, forest weeds, technical properties and uses of timbers, and the essentials of fruit culture; (3) principal soils; (4) management, regeneration and systems of felling, raising trees from seeds, cuttings, layers, etc., and the common implements of forest culture; (5) operations of felling, working up, and haulage of wood, and the rules concerning them, practical road-making, harvesting, and preserving seeds and bark, the action of forest-humus and the effects of its removal, the utilisation of peat, windfallen wood, pasture, and grass; (6) injury to forests from man, animals, plants, or physical causes, with preventive and remedial measures, laws and regulations concening forests and foresters; (7) forms, observances, and laws relating to the chase, practice in shooting; (8) the principles of working-plans and the rules concerning boundaries and division of forests, forest mensuration, and the methods of estimating the annual fellings; (9) service regulations of the Bavarian forest service; (10) recording transactions, preparation of reports, registers, diaries, accounts, etc; (11) free-hand and map-drawing, particularly copying plans of estates, preparation of surveys for sales, etc.; (12) popular law.

There are four classes, and the number of hours devoted to each branch of study is as follows:—

	Number of Hours per week.			
	1st Class.	2nd Class.	3rd Class.	4th Class.
(*a*) Religion	2	2	2	2
(*b*) General subjects	11	9	5	3
(*c*) Technical instruction, viz.:				
(1) Sciences bearing on Forestry	1	2	3	3
(2) Forestry proper	1	2	5	7
Total	15	15	15	15

In addition to the work done in the school, as much study and practical work as possible is to be done in the forest. Other hours are set apart for private study. Further details of the work are drawn up by decree of the Ministry of Finance.

The teaching staff consists of (1) the director of the local forest district, (2) an assistant forest officer, (3) a master for the general subjects, (4) the local Catholic and Protestant clergymen, (5) an assistant master for technical subjects, and (6) an assistant master for the general subjects.

Boys commence in the first class, in which, as a rule, not more than ten pupils are admitted. Candidates for admission must be between 13 and 16 years of age, be Bavarian subjects, have duly completed their education in the elementary school, and be of sound constitution, particularly as regards eyesight and hearing. They are required to complete the whole school course. The pupils lodge and board with families in the neighbourhood, the family selected being subject to the approval of the director.

The winter term lasts from the 18th September till the Friday before Palm Sunday (with a ten days' break at Christmas); the summer term from the second Tuesday after Easter until the 14th July.

There is an entrance examination—in the subjects taught at the elementary schools—and a final examination upon completion of the course. The latter is intended to test the fitness of the fourth class students to enter the lower grade forest service of the State; its scope embraces the whole of the instruction given in the school, and is both written and *vivâ voce*. The written examination is conducted by the masters in each subject with the aid of another member of the staff nominated by the director. The *vivâ voce* examination is conducted by a committee, and is divided into two parts of one hour each, one in the school and the other in the forest. As a rule, the examiners in the school are the masters in each subject. The committee determines the results of the written and oral examinations, and decides whether the candidates have passed. This committee consists of the head officer (*Oberforstrath*) of the district, or his representative, the director, and the other members of the teaching staff.

Half-yearly, annual (for the three lower classes), and leaving certificates are given. The first of these merely records the pupil's conduct and diligence; the annual certificate shows his marks for conduct, diligence, and progress in each branch of study, together with an average mark and a statement as to fitness to enter the next class. The leaving certificate records the result of the final examination, with a statement of his conduct and diligence during the whole of his time and of his fitness for State service.

The entrance fee is 3s., and the annual tuition fee £1, payable in ten monthly instalments. A fee of 6d. is payable for the half-yearly certificate, 1s. for the annual, and 2s. for the leaving certificate.

Appendix XXV.

APPENDIX No. XXV

INFORMATION as to the ASSISTANCE, by means of LOANS, INSPECTION, REMISSION of TAXATION, etc., that FOREIGN STATES give to planters, and the ENCOURAGEMENT they offer to the AFFORESTATION of WASTE LANDS. By Dr. ADAM SCHWAPPACH, Director of the Prussian Forestry Investigation and Professor of Sylviculture at the State School of Forestry, Eberswalde.

In proportion as population grows, as the employment of wood for industrial purposes increases, and as the natural supplies of wood tend to become exhausted, greater attention is paid by Governments to the maintenance and better management of the woods still remaining and to the formation of new woods.

Afforestation is undertaken (a) by private proprietors, (b) by co-operative or communal bodies, (c) by the State itself. In this connection the formation of forests by private proprietors falls to be considered first.

In former times it was believed that even private afforestation could best be secured by legal compulsion. In the older forest laws we often find regulations that "the waste lands" must be sown or planted. The results obtained in this manner were, however, small; besides, measures of that kind correspond no longer to modern views. In recent times, therefore, encouragement to State afforestation on private lands has been given partly by instruction and partly by subventions.

To induce the formation of new woodlands by private proprietors, it is necessary first to convince them of the use of the forest, and then, when the inclination to afforest exists, to teach them how the forest is to be formed and subsequently managed. The first of these tasks is greater and more difficult in proportion as a country is little wooded and its forestry has been hitherto bad.

An interesting example of these conditions is afforded by the United States of North America, where the movement in favour of afforestation has been growing steadily for about 10 years past. It is there ably impressed upon the people in journals and pamphlets that the formation and management of woods is a thoroughly profitable business.

Besides these methods, discussions and transactions of societies and meetings also play an important part. These latter are especially important in connection with the spread of knowledge of the most appropriate methods of forming and managing woods.

Where there is a State forest staff, the officials generally consider it an honour to help in the spread of a knowledge of forestry in societies and meetings. In States where no such staff exists special officials are frequently appointed for this purpose.

Thus the chief task of the Bureau of Forestry in the United States Department of Agriculture consists in the spread of forest knowledge and in the advancement of afforestation. In Russia, by the Order of 23rd January, 1888, forest divisional instructors have been introduced, with the following duties: (1) To give oral and written advice concerning forestry, (2) to inspect State and private forests, and (3) to guide the execution of forest operations of all kinds. In Austria the technical forest staff of the administration has the duty of . . . (2) encouraging forestry by the instruction of forest owners who stand in need of teaching or guidance. In Bavaria nine forest officials have been appointed within the last two years, in districts where there are no State forests, with the sole object of encouraging forestry and carrying out the forest administration.

An increase of forest knowledge by providing instruction in the elements of sylviculture in farm schools and agricultural colleges is also very necessary. Such work has grown in a marked manner in recent years in Germany.

Private proprietors and the employees of small owners have often but little knowledge of forestry, and it has been found most useful to bring the foresters of small owners together for a practical course of a week or so, during which they themselves perform forestry operations under proper guidance, receive a few hours of lecture-room instruction, and make excursions.

It may also be mentioned that at the chief Agricultural College of Austria there are annually held courses of two weeks' duration. These are of the nature of vacation courses, and embrace class-room instruction and excursions. These are designed for forest owners and the members of their higher forest staff.

The appointment and pay of officials who in the manner described above provide for the spread of a knowledge of forestry forms one of the chief means by which the area under forest may be increased. Of what use are the most munificent subsidies when either the will or the capacity for their proper application is wanting?

I shall return later to the benefits derived from the appointment, by several Prussian Chambers of Agriculture, of "forest advisers."

Material assistance towards afforestation is given in many States by the grant of monetary premiums.

Thus in Prussia the State has long paid from a half to two-thirds of the cost of cultivation (on the average of late years 12s. per acre) in districts where the afforestation of private or communal land seemed especially desirable. With such State assistance over 27,000 acres have been afforested in Prussia during the years 1882-94 (outside the Eifel, Hohe Venn, and Westerwald, to which special funds are allocated). The total amount paid during this time for the promotion of private woods on waste land amounted to £55,500.

In Russia there are annually granted for forest cultivation and rational wood formation 140 premiums, each of 100 roubles, with a silver medal; two premiums of 500 and two of 300 half-imperials, each with a gold medal. The Hungarian Minister of Agriculture annually awards six principal and six minor premiums for afforestation. Two premiums are of 1,000 crowns each, two of 800 crowns each, and the smaller of about 100 crowns each.

Such assistance is always given on an exceptionally large scale wherever it is a question of forming protective woods. The oldest law providing for this encouragement is the French, of 28th July, 1860, which says in Art. 1: Subventions may be granted to communes, public establishments, and individuals for the re-afforestation of ground on the summits or slopes of mountains. These subventions consist either of a grant of seeds or plants, or of a money premium. According to Demontzey ("L'extinction des torrents en France par le reboisement," Paris, 1894), 156,885 acres have been afforested in France since the law came into force with optional State subventions, of which 67,125 acres belonged to private individuals. The State contributions amounted to about 22s. per acre on the average or 50 per cent. of the cost.

Another form of State assistance is common in the United States of North America, where the normal size (160 acres) of a farm under the Homestead Act was quadrupled if the acquirer undertook to afforest a portion. The results obtained thus are nevertheless small, as in most cases there were wanting the knowledge, and often the will, necessary for afforestation.

In many States, as in Prussia, Bavaria, Saxony, Hesse, there exist special credit institutions, or agricultural banks, possessing a State character, for the encouragement of the cultivation of the soil, under which term is included the afforestation of waste lands. These banks give loans for such purposes at moderate interest (3½ to 4½ per cent.), plus ½ per cent. for redemption of loans. Very little use has, however, up to the present been made of them for forestry purposes. Otherwise, loans are only granted for the formation of protective forests (*e.g.*, Hungary).

Remission of taxation for new afforestation is found only in a few countries, and mostly only for protective forests. Only in Baden is there exemption from taxation during 20 years for all new woodlands. Hungary admits a reduced taxation on all forests managed on regular working plans. In France plantations on the summits and slopes of mountains, and on dunes and heaths, are exempted from taxation for 30 years. In

Russia and Hungary protective forests generally enjoy complete exemption from taxation.

The method of encouraging private forestry, but more especially the formation of new woods, by distributing plants and often seeds, either gratis or at much reduced prices, is very widespread. In Prussia, for instance, up to 100 million young forest trees are distributed every year under these conditions. In 1893-4 there were distributed 2,038,142 young hard woods, and 29,898,350 conifers for £3,929.

In many districts of Germany, where property is much sub-divided, and afforestation is peculiarly difficult for private individuals owing to want of knowledge and means, afforestation societies have been formed, as in Westphalia, Hanover, Schleswig-Holstein. These societies are not only subsidised with money, as described above, by the State and local administrative bodies, similar to English County Councils, but are in a position to purchase seeds upon a co-operative basis at low prices, to grow the plants in their own nurseries, and distribute them to members. These societies are sufficiently well off to secure experts at their own expense, who, by teaching and inspecting, watch over the correct and successful treatment of the woods.

In course of time, and especially in the interests of the owners of private woods, necessity has effected, through the agency of State-aided special control stations, the placing of the tree-seed industry in the same position as agricultural seeds.

France was the first to introduce such a seed-control station for tree-seeds at Barres-Vilmorin. The seed control stations at Zürich and Tharand, especially the former, occupy themselves to an increasing degree with the examination of such seeds. Special control stations for tree seeds have further been instituted in connection with the forest experimental stations, in 1889 at Mariabrunn for Austria, and in 1900 at Eberswalde for Prussia.

The results up to the present clearly show how extraordinarily valuable, particularly for private owners, such institutions are; for the seed merchants are not always sufficiently trustworthy, and the private individual is not in such a favourable position as the State to secure protection against deficient consignments.

Given the presence of a State staff of forest officers, it is important that these should have a general permission to undertake the management of private woods already in existence as a secondary occupation, so far as their main occupation permits. The example also given by Saxony, where the State Forestry Bureau undertakes the preparation of working plans, and the regulation of the management for private wood owners for a small remuneration, is greatly to be recommended.

In various German States, for instance, in Hesse and Baden, the private forests are organised by the State; so that there, within a conveniently situated group of private forests, belonging to various owners, the supervision is performed on a co-operative basis by a single official.

From the preceding short review of the various means adopted for the encouragement of afforestation, it appears that, from the point of view of material, as contrasted with advisory, assistance, the most important by far is the bearing by the State of a part of the cost of culture. For obvious reasons, however, this form of encouragement has its limits. To pay 50-70 per cent. of the costs of cultivation is the rule; the State only goes beyond this amount where the public interest specially demands it, as in the case of protective forests. It is not advisable for the State contribution to fall much short of 50 per cent., for then the inducement to afforest becomes too small.

It must be emphasised, however, that even the most thorough-going State subsidisation will be unsuccessful if the people do not understand the value of forests; or if they have not the knowledge necessary for the proper execution of the work, cannot select suitable species or manage the forest, when formed, properly. Hence, in most recent times, and especially in Germany, but also in other countries, notably the United States of North America, the endeavour is made, not only to spread an ever-widening knowledge of the importance and profits of woodland, but also to create a staff which is ready and qualified to be active in this direction, and to be at all times at the side of the private individual with counsel and instruction. In this connection, reference may be again made to the Forestry Bureau of the United States Department of Agriculture, which is seeking to create such a staff in its field assistants. The most complete system seems to me to be the system of forestry advisers, which has existed for some years past in connection with several of the Prussian Chambers of Agriculture, and which I shall now shortly describe.

Since 1895 the former agricultural societies in Prussia have been definitely organised as Chambers of Agriculture, and act as the official representatives of agriculture and forestry in their districts. To defray the expenses necessary in furthering their aims, they have at their disposal means, partly assigned by the State or provincial Government, and partly derived from contributions levied upon the agricultural and forestry industry in their districts.

Various Chambers of Agriculture (that of Brandenburg being the first, in 1899) have now, in order to advance private forestry, appointed their own technically educated forest officials, with the title "Forest Adviser." The salary (£200-250 per annum) of this official is paid by the Chamber, and he also receives out-of-pocket travelling expenses, and 15s. for subsistence per day. His task consists in the first place in giving information on every possible subject connected with forestry to private proprietors, partly in writing, and partly orally, after an inspection on the spot. If a visit is necessary, the proprietor bears the cost of travelling and subsistence. Besides, the forest adviser must, on his own initiative, take such steps as are calculated to advance forestry. The principal of these are giving lectures at meetings of agricultural societies, instituting courses for the staffs of forest owners, and, if desired, for the latter also, arranging for the co-operative purchase of good seeds and plants, facilitating the sale of wood by publication of current prices, etc.

In Brandenburg, with 783,000 acres of private forests, the Chamber of Agriculture has at its disposal for forestry purposes, £250 from the State, £150 from the province, and £250 from its own funds, or a total of £650* annually. The above-mentioned State subventions in aid of afforestation, which are paid directly to the owners of the land, are not included in this sum. This sum of £650 is sufficient to cover the salary and travelling expenses of the forest adviser, so that proprietors desirous of consulting him have only to defray his costs of subsistence. These costs are by convenient combination of different journeys reduced as far as possible.

This system has rapidly acquired great popularity. The officer concerned was out for 120 days in 1901, and it has already become necessary to appoint a second official, whose chief duty it is to work out the details of working plans.

For private proprietors the great advantage follows, that they have at all times at their disposition a qualified person for an insignificant payment; on the other hand, forestry receives a great stimulus from the lectures and courses given by a man intimately associated with local conditions.

For English conditions it seems to me that the creation of posts on the pattern of the forest advisers, and filling them with young and diligent persons, knowing Continental conditions from personal acquaintance, and, above all, practically entrusted with methods of forest culture, would be of the greatest importance.

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* In comparing this sum with the area under forests, it is to be noted that at least 40 per cent. of the wooded area belongs to large proprietors, who, with their own staff, are able to manage their forests in a fairly satisfactory manner, and who would therefore require no financial assistance from the Chamber.

Appendix XXVI.

APPENDIX XXVI.

A REVIEW of the RESTRICTIONS, in the PUBLIC INTEREST, that STATES place upon PRIVATE OWNERS of FORESTS. By Dr. ADAM SCHWAPPACH, Director of the Prussian Forestry Investigation, and Professor of Sylviculture at the State School of Forestry, Eberswalde.

There are two fundamentally different systems in administrative legislation dealing with forests belonging to private individuals.

(1) The first system leaves the owner an entirely free hand in the management of his woods and the utilisation of their produce, provided the public interest does not necessitate any restrictions. Public interests demand restrictions in the management of private woods only when such woods are protective. Woods are said to be protective when from their situation and the nature of the land enclosed within them, they are of importance to the cultivation, not only of the land that they enclose, but also of neighbouring land, or of land at a distance (*e.g.*, land liable to floods).

The protective action of a wood consists mainly in binding the soil. Thus in the plains protective forests occur chiefly on light sand which has a tendency to drift ("flying sand"), while on mountains and hills they are chiefly concerned with preventing torrential floods or the washing away of soil.

(2) The second system aims at applying the limitations on private forestry—to be described further on—either wholly or partly to all forests without distinguishing those which are protective. This system is the older, and is indigenous more particularly in those countries where the State has for centuries exercised an influence on private forestry. It has recently attained some academic interest, because the distinction between protective and other woods is beset with difficulties; so that woodlands are sometimes defined as protective whose action in this respect is not obvious, but which a wider knowledge may one day show to be so.

In Germany it is only in the central and southern states that there is State interference with private woodlands; and there 29·7 per cent. of the total private forests of Germany, or 14·6 per cent. of the total forest area, is under State control; 70·3 per cent. of the private forests being subject to no legislative restrictions whatever, in so far as they are not protective forests (Prussian and Saxony). Outside Germany freedom as regards the management of private forests (except when these are protective) is unrestricted in, for example, Hungary, France, Italy, the lowlands of Switzerland, and in Sweden. The latest Bill for an Italian forest law, however, proposes State supervision of all woods.

The following State measures restricting the free management of private woods (apart from legislation concerning protective forests) may be enumerated:—

(1) Prohibition of deforestation, *i.e.*, the prohibition to apply areas, hitherto used as forest, permanently to other uses after removal of the stock of trees. This regulation is, in and out of Germany, still the most widespread, and comparatively the easiest to carry into effect. It is found in, *inter alia*, Bavaria, Wurtemburg, Baden, Austria, and Russia.

The prohibition to deforest is, nevertheless, nowhere absolute, but the process may be anywhere permitted under certain conditions. In most cases it must be shown that the area shall permanently give a higher return when applied to other purposes, also that the removal of the wood shall in no way injure public or private interests. Besides this, the following regulations may be mentioned:—Deforestation is permitted (a) if an area of similar character is elsewhere appropriated to the growth of trees (Russia, some cantons in Switzerland and Hesse), (b) if the area is only small (Hesse, where isolated patches of wood not exceeding 6¼ acres, may be so treated), (c) if the area is to be used for roads or rectification of boundaries (Brunswick, Russia). As a further example, it may be mentioned that the Russian law of 1888, Article 11., further lays down that deforestation is permissible in dividing a property and in artificially afforested plots, if the stock of wood has not attained more than 20 years of age.

(2) The requirement to afforest exists according to present forest legislation only in the compulsory reafforestation of woods which have been felled, generally within a definite time after the utilisation of the old stock (Wurtemberg, Bavaria, Baden).

Afforestation of new areas which were not previously under wood is only required by laws dealing with protective woods and the regulation of torrents (Switzerland, Prussia, France, Italy, Hungary).

The effective application of laws relating to compulsory afforestation presupposes that the forest authorities possess the power of compulsory intervention in case of necessity, and of executing the work with their own staff at the expense of the negligent owner. Practically this compulsory afforestation is very difficult to carry out, since by simply leaving a few seed trees, by strewing the area with birch seeds, or by allowing stool shoots to grow up, the actual letter of the law can be satisfied, while really letting the land go to waste.

(3) Prohibition as regards careless or injurious management. In previous centuries there was already a desire to render secure, by means of administrative regulations, as well as State supervision, not only the continuance of forests, but also their proper treatment. Modern laws designed to secure good management are in many cases founded on these old enactments.

Modern requirements are of an exclusively negative character, and prohibit treatment which would result in the destruction or degradation of the forest. The following may be noticed: (*a*) Irrational utilisation, as by over-thinning or the felling of immature trees; and (*b*) diminution of the productive capacity of the soil, for example, by the unregulated withdrawal of litter, by neglect to restock denuded areas, etc.

Forest laws have sometimes had regard to the former, sometimes to the latter of these objects. Thus, for example, the Baden forest law prescribes that the forest authorities should intervene in cases where forests are being ruined by mismanagement; the Russian law of 4th April, 1888, forbids, in Art. 13, even in non-protective woods, "clear-fellings conducted in such a manner as to ruin the factors of production, and so to render natural regeneration impossible, and to transform clearings into barren areas."

The Bavarian, Hessian, and Austrian laws, on the other hand, understand by forest degradation or deterioration treatment which would result in a diminution of the productive capacity of the soil, or an entire destruction of the fertility of the soil.

However desirable in the general interest may be the proper treatment of all woodlands, it is difficult, if not impossible, to attain this end by legislative compulsion.

The idea of forest degradation, to the prevention of which States now limit themselves, is very elastic, and can hardly be so sharply defined from the legal point of view as to admit of a judicial, impartial execution, which shall be free from administrative jobbery. It was owing to the fear of such inconveniences that the Prussian Government lately failed in its attempt to grant its subsidies for afforestation only upon the condition that the woods so aided must be subjected to the supervision of the State. Owners have preferred to renounce the subsidy rather than subject themselves to this supervision.

Peculiar difficulties result from the fact that decisions as to the permissibility or otherwise of the measures under consideration are made, as a rule, from the standpoint of the large permanent forests, while the woods of small owners often acquire value and importance solely through being treated in a fashion which is inadmissible on large estates.

The opinion of the Council of the Empire annexed to the Russian law of 1888 accordingly expressly excludes from the above-mentioned provisions for the protection of woods those forests which have been handed over to the peasants by deed and legal enactments for the improvement of agricultural industry.

Finally, against a prohibition to allow woods to degrade or deteriorate there is to be urged the difficulty of carrying it into effect. The supervision of private forests can only be performed by a special technically educated staff, which is nowhere at the disposal of the authorities in sufficient numbers for this purpose; not

even in Austria, which possesses its own technical forest officials in the administration.

(4) In previous centuries there were also numerous positive prescriptions relating to the time of felling, the manner of felling, and method of management, which have almost completely disappeared from modern forest laws.

Among more recent laws, only that of Reuss, a small State in Germany (1893) prohibits clear-felling without special permission; in Russia and Schwarzburg-Sondershausen definite wording plans must be prepared and followed; the latest Bill of an Italian forest law provides, in definite cases, for the issue of regulations concerning management in case of necessity from time to time. The Austrian law of 1852 prescribes, in Sections 5-7, particular methods of management for woods on drifting sands, on the banks of the larger sheets of water, as well as where danger to neighbouring forests from wind would result from clearing. These last measures must be regarded as intermediate between freedom of action and the restrictions associated with protective forests.

(5) In regard to administration, various forest laws also contain certain provisions:—

(*a*) In Austria and Hungary the owners of some classes of private woods must appoint forest officers, who have fulfilled certain requirements as to their education and training. In Austria, this holds for the larger forests. The determination of the minimum size of these forests is left to the particular provinces. In Hungary the owners of entailed woods and of common woods, as well as mining companies and the proprietors of similar industrial undertakings, are subject to these provisions.

(*b*) The compulsory taking over of the management of private forests by the State on account of illegal treatment by the owners is a penalty imposed in Wurtemberg, Baden, and Lippe-Detmold.

(*c*) In many States private owners are obliged to provide the necessary staff to protect their forests, just as in others they have to appoint foresters with certain qualifications; for example, in Baden and Russia. In Austria and Hungary this provision holds at least with reference to those forests for which there exists an obligation to appoint a forest officer as shown above under (*a*).

The supervision over protective forests, where these are distinguished in legislation, is not everywhere equally vigorous.

The older laws concerning the management of protective forests aim only at maintaining the forests actually in existence. With this object they all not merely prohibit deforestation and deterioration, but also contain special provisions regarding the management. In particular, the regeneration of protective woods must be so arranged as to avoid large clear-felled areas. It must, in fact, be accomplished either on the shelter wood compartment system, or in the band or strip system (Austria, Bavaria, Wurtemberg).

The more recent forest laws mostly avoid such general provisions concerning management, and leave the measures to be taken in each particular case to the authorities entrusted with the execution of forest protective laws (Prussia, Russia, and France), or authorise such further measures in addition to certain general provisions (Switzerland, Italy).

Recent protective forest legislation, however, also aims at the creation of such protective forests. Legal compulsion to afforest is implied in all those laws which leave the executive authorities a free hand with regard to the management of protective forests; it is thus in France, Austria (law concerning the regulation of torrents, 30th June, 1884), Switzerland, Italy, Hungary, and Russia. This compulsory creation of woods possesses special interest in connection with the regulation of torrents, where especially the formation of new woodlands must go hand-in-hand with hydrotechnical work. In France a similar compulsion exists also for the treatment of sand dunes (Decree of 10th December, 1810, relative to the planting of dunes).

With regard to the views which exist in Germany amongst those who are specially interested in forestry upon the appropriateness of the two systems, viz. (a) freedom of private forestry in general, but with stringent measures for protective woods, and (b) administrative guardianship of private forestry, without reference to its protective properties, reference may be made to the transactions of the German Forestry Council at its sitting of 17th September, 1899, when a discussion took place upon the aims and methods of protective forest legislation in the German Empire.

The South German representatives recommended for the whole of Germany the adoption of the system there in force of general administrative supervision; but the proposals to this effect were rejected by a large majority. Solely to avoid increasing the difficulties of the Wurtemberg Government, which was preparing a revision of its forest laws, the following resolution was finally accepted by a small majority: "In view of the difficulties of a strict legal definition of protective forests, and the equally great difficulty of determining which woods in any district shall be called protective, the Forestry Council approves the principle which has found expression in the legislation of the South German States, giving the State a right of inspection over the entire forests of the country." The debate and division, however, distinctly showed that a reintroduction of State supervision in countries where it had once existed, but had been abandoned, was impracticable, and could not be recommended.

When it is considered that at this meeting, comprising the élite of the forest officers and forest proprietors of Germany, only a bare majority were found to favour general State supervision over private forests, and to support a resolution that bound no one, it is clear, without going further, what would be the fate of a similar proposal in a country like England, where the popular feeling as regards State interference with private affairs is much more antagonistic than in Germany.

Appendix XXVII.

APPENDIX No. XXVII.

RECEIPTS AND EXPENSES OF STATE FORESTS IN FRANCE AND GERMANY.

Country.	Year.	Total Area.	Area under Wood.	Total Receipts.	Total Expenses.	Net Receipts.	Net Receipts Per Acre of Total Area.	Net Receipts Per Acre of Area under Wood.
		Acres.	Acres.	£.	£.	£.	£. s. d.	£. s. d.
France - - -	1892	2,690,067	*2,205,283	1,046,120	—	—	—	—
Germany:								
Prussia - - -	1899	6,914,063	6,203,516	4,350,660	2,182,443	2,168,217	- 6 3	- 6 8
Bavaria - - -	1898	2,312,325	2,053,049	1,861,028	876,398	984,630	- 8 6	- 9 7
Würtemberg - -	1900	482,518	459,499	750,222	254,850	495,372	1 - 6	1 1 6
Saxony - - -	1901	436,668	419,709	685,217	279,439	405,778	- 18 7	- 19 4
Baden - - -	1900	232,373	228,442	384,586	156,854	227,732	- 19 7	- 19 11
†Alsace-Lorraine -	1900–1	377,113	370,596	384,345	186,072	198,273	- 10 6	- 10 9

* A considerable proportion of this consists of mountain land newly acquired or newly planted which as yet yields no revenue.

† Including 40,143 acres owned jointly by the State and local authorities. The State's share of the receipts and expenses is included.

Appendix XXVIII.

APPENDIX No. XXVIII.

THE UNITED STATES BUREAU OF FORESTRY.

(From the Year Book of the U.S. Department of Agriculture for 1901.)

The Bureau of Forestry (Forester and Chief, Mr. Gifford Pinchot) forms part of the Department of Agriculture. Until 1st July, 1901, the Bureau was only a division, but on that date it was advanced to the grade of Bureau, and provision for its expenses was made by an appropriation of £38,633.

The Bureau of Forestry is made up of the Division of Forest Management, the Division of Forest Investigation, and the Division of Records. Each of these continues, with enlarged facilities, work which was in progress under the old Division of Forestry. There were during 1901 in all 179 persons engaged in the work of the Bureau. Of this number 81 were student assistants—young men, largely college students, who expect to enter forestry as a profession, and who served during the summer on small pay for the sake of the experience gained.

The field work performed by the Division of Forest Management includes the study of forest conditions and problems all over the country, giving advice to owners of private lands, and the supervision of conservative lumbering operations which illustrate forest management on business principles.

When the owner (public or private) of woodland wishes to consider the possibility of his property if handled as a constant source of timber supply, the tract must be examined by an expert to ascertain the condition of the standing timber, the prospects of reproduction, the facilities for marketing, the best method of harvesting the present crop so as to secure the largest present and future yield, and the likelihood of success under management. A preliminary report is made. If the owner decides on management, a working plan follows. This involves a careful study of the rate of growth of the different kinds of marketable timber, the computation of the proper interval between cuttings and of the amount of timber to be harvested, and, if desired, the recommendation of the necessary regulations to enable the work to go on under contract. All this falls to the Division of Forest Management.

The Division of Forest Investigation makes studies of trees, and their rates of growth, distribution, reproduction, and habits; and investigates the forest problems connected with fires, lumbering, grazing, tree planting, stream flow, and erosion.

The Division of Records includes all office and routine matters, and also has the custody of the library of forest literature, and of a unique collection of photographs, which is continually being added to, illustrating forests and forest conditions all over the United States.

The sums entered in the appropriations of the Department of Agriculture as set apart for "forestry investigations," have been £8,333, £16,667, and £30,475 in the three years ending June 30th, 1900, 1901, and 1902 respectively. These sums are apparently exclusive of salaries.

The scope of the work performed by this Bureau is best shown by the following extract from a report of the Secretary of Agriculture upon this branch of his Department's work in 1901:—

"The work of this Bureau includes the making and execution of working plans for Federal, State, and private forest lands; the study of forests, forest fires, forest grazing, commercial trees, lumbering, and forest products; the study of economic tree-planting, and the preparation of planting plans. The Bureau is co-operating with the Federal Government, with several States, and with many private owners, in handling their forest lands. Its assistance has been asked for a total area of 52,170,036 acres, of which about 4,000,000 acres are held by lumber companies and other private owners. In its studies of commercial trees and forests it is pursuing lines of investigation indispensable to the development and perpetuation of our national forest resources. Its work of tree planting on the treeless plains already involves the making of planting plans for many thousands of acres of wood lots, shelter belts, and commercial plantations.

"On the 1st of July of the present year the Division of Forestry became a Bureau. The change was incidental to the partial reorganisation of the Department of Agriculture by Congress at its last session, but it was brought about by the increased understanding of the need of forestry among our people, and especially by the appreciation in Congress of the practical methods used by this Department in its forest work. The change from a Division to a Bureau opens a way for larger organisation and more extended work, which the public and private demands for assistance in practical forestry have made imperative. The work of the Bureau of Forestry is now conducted along three principal lines. First, forest management, which involves the preparation and execution of working plans for Federal, State, and private forest lands; second, forest investigation, which includes the study of commercial trees, of economic tree planting, of forest fires, grazing, lumbering, forest products, and other important lines of research; and third, the making and maintenance of records, which covers the routine work of the Bureau and the care of its library, laboratory, and photographic collection.

"I am glad to report that the Bureau, under its present organisation, can meet much more effectively the demands made upon it than was possible as a Division. During the fiscal year these demands have not only increased along lines already established, but the growing tendency to refer all important forest matters to the Bureau has been more marked than at any time in the past.

"The demands for the assistance and advice of the Bureau are insistent and widespread, and its sphere of usefulness has extended widely with the sound and steady development of the forest movement. With the added effectiveness of its present organisation, the adequate extension of its field force, now first made possible by the training of men in our forest schools, and the urgently growing need of its services, the Bureau of Forestry has before it a future rich in possibilities for useful work if its resources do not fall too far behind its actual needs. I have not hesitated to recommend a considerably increased appropriation for the Bureau of Forestry for the coming fiscal year, because of the vast interests which depend on forest preservation and wise use. In a very real sense an appropriation for these purposes protects and promotes the interests, among others, of all that vast body of our citizens to whom the success of irrigation, mining, grazing, transportation, or the timber trade, are of primary importance.

"The rapid progress of interest in forestry throughout the South is most gratifying. A very considerable proportion of the most important recent work of the Bureau of Forestry lies in the Southern States.

"With the view to encouraging the substitution of conservative for destructive methods, the Bureau has undertaken the preparation of working plans, giving full directions for the management of forest tracts, and will also afford practical assistance on the ground, without cost to the owners of wood lots. In the case of large tracts, however, the cost of travelling expenses and subsistence, together with the necesary helpers of the agents of the Bureau while in the field, must be borne by the owner.

"*Forest Management.*—The requests upon the Bureau of Forestry from private owners for practical assistance and advice in the handling of their forest lands continue steadily to increase. Of the recent requests for assistance the most noteworthy is the joint application of the Kirby Lumber Company and the Houston Oil Company for help in devising the best method of managing 1,000,000 acres of long-leaf pine land in Texas. This area includes considerably more than half of the long-leaf pine lands in that State.

"Personal examinations in the woods were made during the year of 788,890 acres of private ownership, and four detailed working plans were prepared, covering an area of 226,000 acres. One of these was for the tract of a lumber company in Arkansas, and another for a tract in Missouri, owned by the Deering Harvester Company. The preparation of working plans was begun upon five timber tracts of private ownership, with a total area of 628,000 acres. The largest of these consists of 300,000 acres in Maine, owned by the Great Northern Paper Company. The fact that the offer of co-operation under which these working plans are made is being taken advantage of so extensively by lumber companies and other business organisations indicates clearly the real practical value of the Bureau at Forestry to private owners.

"The preparation of working plans for the federal forest reserves goes steadily on. The working plan for the Black Hills Forest reserve has been completed, and working plans have been begun for the Prescott, the Bighorn, and the Priest River forest reserves. The immense labour involved in some of these plans is indicated by the fact that for the Black Hills plan alone the diameter of every tree, large or small, was measured on 10,234 acres, and complete ring countings were made for 4,500 trees. All these field measurements require painstaking elaboration in the office.

"In co-operation with the State of New York, which appropriated $3,500 for that purpose, the field work necessary to a working plan for townships 5, 6, and 41, Hamilton County, in the Adirondack Forest Preserve, has been completed. The results of similar co-operation on township 40 have already been published in the form of a complete working plan.

"*Forest Investigation.*—Studies of commercial trees, the practical advantages of which are becoming more and more evident, were continued during the year, and extended to many species hitherto not investigated. Extensive studies of the redwood, red fir, and hemlock of the Pacific coast have been completed, and are ready for publication. Other trees under investigation are the Western yellow pine, the loblolly and short-leaf pines, the more important Southern hardwoods, the Adirondack balsam, and the second-growth hard woods of New England. The location, size, and ownership of the Big Tree groves in the California sierras have been thoroughly studied for the first time, and much fresh information has been obtained of the character of the tree.

"The region containing the proposed Appalachian Forest Reserve was examined in co-operation with the United States Geological Survey. The forest on 9,600,000 acres was mapped, the lands were classified, and a careful study was made of the forests. The result of this examination will be embodied in a report dealing with the suitability of this region for the purpose of a national forest reserve, the cost of such a reserve to the Government, and the good which would result from its careful and conservative management.

"The creation of the proposed reserve is, in my judgment, urgent, in order to protect the headwaters of important streams, to maintain an already greatly impaired supply of timber, and to provide a national recreation ground which, with the single exception of the Adirondacks, will be readily accessible to a larger number of people than any other forest region in the United States. I believe that these considerations render the purchase by the Federal Government of the proposed reserve in the Southern Appalachians desirable in every way. The policy involved is not new. The proposed purchase will not involve the creation of a precedent, for that has already been done. In 1896 the Government purchased from the Blackfeet Indians of Montana an area of approximately 615,500 acres for the sum of $1,500,000, and on February 22nd, 1897, it became part of the Flathead Forest Reserve.

"A study of the Sierra Forest Reserve has been undertaken, also in co-operation with the United States Geological Survey, and will shortly be completed.

"Following the requests of the Secretary of the Interior for reports on technical forest matters, the effect of grazing and of forest fires was investigated in twelve of the forest reserves. A study of the present forest condition of Nebraska and of the causes which led up to it was begun and pushed far towards completion.

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"The Bureau is now conducting an investigation in the South to devise conservative and practicable methods for improved turpentine orcharding. Since the maintenance of the naval stores industry is of urgent necessity in the Southern States, this investigation is one of the most important now being carried on by the Bureau.

"*Forest Exhibits.*—The forest exhibit of this Department at the Pan-American Exposition was superior in size and quality to that at the Paris Exhibition, which was awarded a gold medal. It included the largest coloured transparencies ever made.

"*Tree Planting.*—One of the most important and promising lines of work of the Bureau of Forestry is its study of economic tree planting and its co-operation with farmers and others in making forest plantations. Tree planting has so vital and intimate a relation to the welfare of the farmer in the treeless regions, that whatever assists him to grow trees assists him also in the production of every other crop. 46,145 acres were examined for planting during the year, and planting plans were prepared for 5,785 acres, while 148 applications for tree-planting plans have been received. The number of applications for commercial plantations of large size is increasing so rapidly that the usefulness of the practical assistance and advice offered to the tree planters will be limited only by the men and money available for the work.

"A series of important measurements of the growth of planted groves in the treeless plains has been begun in order to show the value of plantations as business investments. A careful study has been pushed during the year of the encroachment of forests on the Western plains in order to determine the possibility of reclaiming portions of non-agricultural Government land by planting forests."

Schools of Forestry.—There are three schools of forestry in the United States:—

(a) New York State College of Forestry, at Cornell University, Ithaca. Four years' course; practical instruction afforded by a demonstration area of 30,000 acres of State forest (*see* Appendix XXIX.).

(b) Yale Forest School, New Haven. A two years' graduate course. In connection with the Yale Forest School a two months' summer course is conducted at Milford, Pa. (*see* Appendix XXIX.).

(c) Baltimore School of Forestry, Baltimore. One year course, comprising practical work in the forest, theoretical instruction and forest research. No botany or other auxiliary sciences.

State Departments.—Sixteen States have official departments or offices for forest work.

Forest Reserves.—As appears from the foregoing report, considerable demands are made upon the Department of Agriculture in connection with the management of the Federal Forest Reserves. These Government reserves are administered by the Department of the Interior, but so closely is the subject of the reafforestation of these reserves related to the work of the Bureau of Forestry that the suggestion has been made by the Secretary of the Interior that it might be found advisable to transfer the supervision of all public forests to the Secretary of Agriculture. The following information (relating only to Federal forests, and exclusive of lands reserved by individual States) is taken from the Reports for 1900 and 1901 of the Secretary of the Interior.

The year 1817 was marked by the first enactment setting apart public lands for the purpose of drawing timber supplies therefrom. This Act empowered the Secretary of the Navy to cause such vacant and unappropriated lands as produce the live oak and red cedar timbers to be explored, and selection to be made of such tracts or portions thereof as might be necessary to furnish for the Navy a sufficient supply of said timbers. Three tracts were to be reserved from any future sale of public lands, and appropriated for the sole purpose of supplying timber for the Navy. Further Acts embodying the same principle were also passed between 1822 and 1831, after which date no further action in the direction of establishing a forest policy was taken for many years.

The agitation in favour of an administration of the forests on the public domain may be said to have begun in 1871 with the introduction of the first comprehensive forestry Bill in Congress. The Bill did not pass, but the movement received a strong impetus in the Department of the Interior, vigorous representations being made more particularly in 1877, which again resulted in the introduction of a Bill, likewise abortive.

It was not until 1891 that a brief clause in the Act of March 3 of that year definitely authorised the establishment of forest reservations, and the first important step was gained. The mere establishment of reservations, however, proved largely ineffectual, in the absence of provision for their administration. The embarrassment resulting from delay on the part of Congress led to the National Academy of Sciences being requested in 1896 to investigate and report upon the subject of a national forest policy for the forest lands of the United States. Following the report of the Academy's Forest Committee, Congress took immediate action by passing the Act of June 4, 1897, under which forest reservations are at present administered.

Generally speaking, the principle is to reserve only vacant lands, although, as has been mentioned above, it is in contemplation to purchase an area of nearly 10,000,000 acres in the Appalachian Mountains, with a view to arresting the rapid denudation going on there, and a "Presidential Message" recommending the purchase has been presented to Congress. The existing State reserves are being surveyed, and working plans prepared, as rapidly as circumstances permit. Grazing is permitted with the approval of the Secretary of the Interior, and in 1901 1,400,000 sheep were allowed on eight reserves, and 434,750 cattle and horses on 27 reserves. One of the most important duties is the prevention of fires. In the year 1900-01 311 fires (that passed beyond the incipient stage) burned 124,423 acres, as compared with 209 fires over an area of 158,577 acres in the preceding year.

The creation of forest reserves commenced immediately after the passage of the Act of 1891, and up to 1893 seventeen reserves had been established, embracing about 18,000,000 acres. After 1897 several other areas were reserved, and the total given in 1901 is 41, covering an estimated area of 46,410,000 acres. The first to be established was the Yellowstone Park Timber Reserve, proclaimed on March 30, 1891. The great majority of the reserves are in the mountainous regions of the West, particularly in California, Washington, Wyoming, Colorado, etc. The largest are: Cascade Range, Oregon (4,588,800 acres); Bitter Root, Idaho and Montana (4,147,200 acres); Sierra, California (4,096,000 acres); Washington, in the State of that name (3,426,400 acres); Lewis and Clarke, Montana (2,926,000 acres); Gila River, New Mexico (2,327,000 acres; and Mount Rainier, Washington (2,027,500 acres).

APPENDIX No. XXIX.

Instruction in Forestry at Cornell and Yale Universities.

(1) The New York State College of Forestry (Cornell University).

(Abridged from the College Prospectus for 1900-01, the Annual Report of the Director for 1901, and the Testimony of B. E. Fernow before the United States Industrial Commission.)

Foundation.—The New York State College of Forestry was established by an Act of the State Legislature in April, 1898, authorising the trustees of Cornell University to create a department in the University for the purpose of education and instruction in the principles and practices of scientific forestry. The State of New York had, by various Acts, declared for a policy of forest preservation, with a view of protecting the watershed of the Adirondacks. In 1885 the State possessed a property of some 600,000 acres of timber, acquired by tax sales, mostly culled and more or less maltreated, and a Forest Commission was instituted for its management. To pave the way for the introduction of technical forest management on this area, a demonstration was proposed on a small scale, which was to show how a forester would manage a forest property, harvesting and reproducing the wood crop. In order to remove this demonstration, which would naturally require a considerable time, from the danger of political vicissitudes, its management was referred to Cornell University, and the College of Forestry was instituted as the agency to carry out the experiment, and at the same time to educate the foresters who would, in the future, manage the State's forest property. The same Act accordingly made provision for a demonstration forest of 30,000 acres in the Adirondacks. This tract has been located in Franklin County, near Tupper Lake, with Axton as headquarters. The area reverts to the State after 30 years.

While a State institution, the College is administered by the University, and its students profit by courses of study in the University classes and laboratories.

A sum of £6,250 was appropriated by the State of New York to start the forest area, and an equal sum was also provided to serve as working capital. For the College a separate annual appropriation of £2,083 has been made.

Staff.—The Faculty consists of the President of Cornell University, of Mr. B. E. Fernow (the Director of the College and Professor of Forestry), and of two Assistant Professors of Forestry. There are, besides, two Special Lecturers, a Forest Manager, and a Superintendent. Instruction in the fundamental and supplementary branches is given to forestry students by 38 professors and instructors of Cornell University.

College Forest.—The College Forest is managed to fulfil in the broadest sense the functions expressed in the Act creating it, namely, to "conduct upon such land such experiments in forestry as it may deem most advantageous to the interests of the State, and the advancement of the science of forestry, and may plant, raise, cut, and sell timber at such times, of such species and quantities, and in such manner as it may deem best, with a view to obtaining and imparting knowledge concerning the scientific management and use of forests, their regulation and administration, the production, harvesting, and reproduction of wood crops, and earning a revenue therefrom." The College Forest is also used for the practical instruction of students. To this end the third and fourth year students are transferred to Axton in the spring, and during the summer vacation opportunity is given to would-be students to become acquainted with forestry work in the College Forest.

The College tract is typical of the Adirondack woods, a hardwood forest composed of sugar maple, yellow birch, and beech, mixed with spruce and hemlock, and in some parts white pine, besides some other species occurring sporadically. Most of the area has been culled by lumbermen of the merchantable pine, which is nearly extirpated, and of the spruce, which has been considerably reduced. It is, therefore, the leavings of the lumbermen, a forest culled of its most valuable materials, which has been set aside for this experiment. There are, besides, the usual balsam and cedar swamps and considerable areas of burnt lands, grown up to aspen and white birch, where formerly the white pine was the dominant tree.

The sylvicultural policy is, briefly stated, to replace the old decrepit natural forest by a new and more valuable forest more or less rapidly. The financial policy is to bring about this change in the conditions of the property, as far as possible, by using only the profits which come from the harvest of the old crop. The first step necessary was, therefore, to find a market, which did not exist locally, for the hardwood. Since the hardwoods do not float, railroad construction is absolutely necessary for transporting the harvest out of the woods. This means that a comprehensive plan for the entire harvest is necessary. Consequently a contract was made with the Brooklyn Cooperage Company to erect stave mills, wood alcohol plants, and a railroad, for the purpose of taking the entire hardwood crop, logs and cordwood, that might be cut for the next 15 or 20 years.

Planting is done only with conifers, since the hardwoods are able to reproduce themselves readily without assistance, furnishing a sufficient amount of this desirable admixture. Large nurseries, in which material is grown from seed, to be transplanted to the woods when two or three years old, have been established. In these mainly white pine and spruce, together with other coniferous species, are grown, more than a million seedlings being now on hand.

The college forest is managed primarily as a business forest; but about 255 acres have been planted in varying manner for experimental purposes.

Admission.—For entrance into the College of Forestry for the full course leading to the degree of "Bachelor of Science of Forestry" (a title since altered to "Forest Engineer") there are required a primary and an advanced examination; but certain school certificates are accepted as exempting candidates from all or part of these. The subjects of these examinations are English, history, plane geometry, algebra, advanced German, advanced French (or Latin), and advanced mathematics. Candidates must be at least 18 years of age.

Admission to the short and synoptical courses is free to all students who furnish evidence to the director that they are able to pursue the work satisfactorily.

Courses.—The regular course leading to the degree lasts four years; and is intended to prepare men fully to take charge of forest estates, private or State, to advise in administration of such estates, and prepare working plans, to take charge of land and timber departments, and finally to teach the science of forestry in the colleges which are likely in the near future to provide separate chairs for forestry science and practice. The first two years of this course are mainly devoted to the study of preparatory subjects, natural sciences, mathematics, engineering, political economy, etc., and the last two years to forestry proper.

To meet the requirements of students of political economy and others who desire a survey of the subject of forestry as a matter of general education, a synoptical or introductory course of two hours a week is given during the second term.

A one-term course is arranged for special students, farmers, lumbermen, young men who cannot spend four years in preparing themselves to become foresters, and who yet wish to avail themselves of technical and practical instruction in forestry that might enable them to manage their own woodlands more intelligently. This course occupies five hours per week during the first term.

The regular course is so arranged that students who can spend only three years at the college will, at the end of that time, have acquired full preparation in the fundamental sciences and in all the forestry branches essential for the successful management of woods, for which working plans have been prepared, the making

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of working plans being deferred until the spring term in the fourth year. To students who have satisfactorily proved their efficiency in this three-year-course, the designation of "Forester" will be given.

Opportunity is also provided for sufficiently advanced students to take up such work as they may be qualified for.

Field Work.—In addition to short excursions to neighbouring woods, to milling and wood manufacturing establishments, etc., during the fall and winter terms of the third and fourth year, these classes will spend the entire spring term after Easter in the college forest at Axton. This term is devoted mainly to practice and field work. This includes

(*a*) Exploitation and Surveying.—Inspection of lumber camps, logging operations, transformation methods, and mills; laying out and constructing roads, dividing and marking forest areas.

(*b*) Sylviculture.—Inspection of and participation in planting, sowing and nursery work, making improvement cuttings, and marking out for thinning and natural reproduction.

(*c*) Mensuration and Valuation.—Tree measurement and studies of the rate of growth, timber estimating.

(*d*) Forest description and regulation.—Gathering data for working plans, and elaboration of such plans for given areas.

Schedule of Courses.—The following table shows the number of lectures per week given in each subject. Courses in parenthesis are either substitutes or elective in whole or in part. The selection must be made at the beginning of the year, with the previous written approval of the director.

	First Year.		Second Year.	
	1st Term.	2nd Term.	1st Term.	2nd Term.
Solid Geom., Adv. Algebra, plane and sph. Trigonometry.	2	2	—	—
Analytical Geom. and Calculus	(3)	(3)	—	—
Physics	2	2	—	—
,,	(5)	(5)	—	—
Chemistry	3	3	4	—
,,	(4)	—	(6)	(6)
Invertebrate Zoology	2	3	—	—
Botany	3	3	—	—
Land Surveying	—	4	—	(2)
Meteorology (Geology)	2	—	—	—
Forestry	—	2	(5)	3
Entomology	—	—	(3)	(2)
Vertebrate Zoology	—	—	3	3
Dendrology (Botany)	—	—	3	—
Geographical Botany	—	—	—	1
General Geology	—	—	3	3
Soils (Geology)	—	—	2	—
Pen Topography	—	—	—	2
Political Economy	—	—	3	3

	Third Year.			Fourth Year.		
	1st Term.	2nd Term		1st Term.	2nd Term	
		At College.	At Axton.		At College.	At Axton.
Botany	3	3	—	—	—	—
Physical Geography (Geology)	(3)	(3)	—	—	—	—
Fish Culture and Game Preservation	—	—	2	—	—	—
Forestry	4	—	5	4	4	—
,,	—	2	2	4	2	10
,,	—	2	5	2	2	2
,,	3	—	3	2	—	—
Political Economy	—	—	—	(2)	(2)	—
Seminary	—	—	—	2	2	2

The various courses in forestry comprised in the foregoing schedule are as follows:—First year: (1) Synoptical course in forestry. Second year: (2) One term course in forestry, with special reference to sylviculture; (3) biological dendrology. Third year: (4) Sylviculture; (5) forest protection; (6) exploitation; (7) forest mensuration; with practicum in sylviculture, forest mensuration, and exploitation and surveying. Fourth year: (8) Timber physics and wood technology; (9) forest regulation; (10) forest valuation and finance; (11) forest administration; (12) forest history and politics; with practicum in forest regulation (making working plans).

Special courses of lectures on various subjects are also provided.

Fees and Expenses.—Tuition is free to students who are residents of the State of New York. To others the annual tuition fee is $100 (about £21), half to be paid at the beginning of each half year. As the first two years are mainly taken up with fundamental courses furnished by the university faculty, the tuition fees for these two years go to the University; during the last two years they go to the College. Special students pay £13 each half-year. Laboratory materials are charged for at cost, and security must be deposited by every person taking laboratory work. In addition to living expenses, which may vary from about £1 to £2 10s. per week, the student should be prepared to meet the expenses for inspection tours, and excursions in the third and fourth years, which may require from £2 to £20 in a year. Expenses in the college forest, including board, lodging, and laundry, may be kept within £1 5s. a week.

Number of Students.—At the beginning of the year 1901-2 the number of students amounted to 35, comprising 3 fourth year, 5 third year, 9 second year, and 13 first year students, besides 5 special students.

Finances.—The expenses of the College are defrayed out of the annual grant of £2,083 from the State. The

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receipts and expenditure in respect of the College Forest are kept entirely separate, and are shown in the following statement for the eighteen months ended 31st December, 1901. The appropriation of £6,250 is to be treated as working capital, to be kept intact and replenished by the sale of log and wood harvest.

Receipts.	£.
Appropriation	6,250
Rents	97
Students' fees	237
Wood sales	837
Work on roads	224
Sundry receipts	462
Logging contract, part payment	5,729
	£. 13,836

Expenditure.	£.
Maintenance	1,002
Improvements (nurseries, planting, road work, &c.)	1,013
Building	144
Equipment	55
Survey	117
Logging	10,403
Balance unexpended	1,102
	£. 13,836

There are now to the credit of the logging account, awaiting delivery and payment, about 2,500,000 feet of hardwood logs, 500,000 feet of spruce logs, and an unmeasured quantity of cordwood, besides other wood materials. Expenditures for permanent investment in railroad, roads, nurseries, buildings, equipment, represented in the above account may be valued at £2,500, not including the value of plantations.

(II.) The Yale Forest School.

(Abridged from the Prospectus of 1901-2.)

The Yale Forest School was founded in the spring of 1900 by the gift of $150,000 (about £31,250) from Mr. and Mrs. J. W. Pinchot and their sons. The gift provides for the establishment of a department in the University, to be known as the Yale Forest School, for instruction and research in forestry. The gift also provides for a summer school of forestry at Milford, Pike County, Pennsylvania, on the estate of Mr. Pinchot, who has placed a building and his woodland at the disposal of the Forest School for twenty-one years.

Equipment.—The school building is equipped with lecture rooms, a library, botanical and wood-testing laboratories, herbarium, and forest museum. The library contains over 1,500 books, and is being enlarged as rapidly as the funds permit. The herbarium consists of more than 2,000 specimens of native and foreign trees and shrubs, and much further material has been promised. The forest museum contains collections of wood specimens representing all the species of trees in the United States and Canada, besides other American and Philippine woods. A large collection of saws has been mounted, and a complete set of axes and logging tools will soon be set up. The botanical laboratory is thoroughly equipped with microscopes and other apparatus for research work in botany. The wood-testing laboratory, now being equipped, will contain testing machinery and other apparatus required in the study of the physical and mechanical properties of wood.

The Yale Botanical Garden, covering ten acres, is used by the students of the school in botanical work, and for experiments in tree-planting; and the use of botanical, mineralogical and zoological collections is extended to the forest school.

Field Work.—The field work during the first year and the first half of the second year is conducted in the forests near New Haven. The most important tract devoted to this purpose is Maltby Park, an area of about 400 acres, the use of which has been granted to the school by the New Haven Water Company. The courses have been so arranged that the entire spring term of the second year is spent in the field. The tract at Milford, Pennsylvania, mentioned above, will also be used for the practical field work of the graduating class during a portion of the spring term. The land is admirably adapted to instruction in forestry, as it represents the average conditions in the eastern hardwood forests. Large tracts in the Adirondacks and White Mountains have been offered to the school for practical forest instruction, by Mr. Rockefeller and the International Paper Co., and the owners have expressed their willingness to provide camps for the accommodation of the students.

Staff.—The teaching staff consists of the director, Mr. H. S. Graves, who is also Pinchot Professor of Forestry; Mr. W. H. Brewer, Professor of Agriculture; and Mr. G. Pinchot, Special Lecturer in Forest Policy; with thirteen "additional instructors."

Degree.—Graduates of the Forest School who have previously received Bachelor's degrees from collegiate institutions of high standing, or who have had an equivalent training, will be granted the degree of Master of Forestry.

Special Students.—Under exceptional circumstances students who are not candidates for a degree, but who can show their fitness to pursue the courses given in the forest school, are admitted without examination. It is, however, the policy to encourage students to take the full course. Those students who wish to take a short course in forestry, and are unable to pass the entrance examinations to the Yale Forest School, are advised to avail themselves of the privileges offered by the summer school at Milford, which is intended to meet their special requirements.

Fees and Expenses.—The annual charge for tuition is $100 (about £21). Laboratory fees of $5 (about £1 0s. 10d.) are charged for each of the courses in mineralogy and morphology of plants. Board and lodgings can be obtained in New Haven at prices ranging from £1 per week upwards. Frequent excursions are taken to points of interest near New Haven, but involve an annual expense of little more than £5. In the spring of the second year the work is transferred from New Haven to the field. The travelling expenses then incurred are about £12 10s., exclusive of subsistence, reckoned at about £1 a week. The graduation fee is $5.

Admission.—Candidates for admission must be not less than 20 years of age, and must produce certificates of good moral character. Graduates of colleges or scientific schools of high standing, who show the requisite knowledge of botany, geology, and inorganic chemistry, are admitted without examination. Other candidates must pass entrance examinations in the following subjects:—Algebra, plane geometry, solid and spherical geometry, trigonometry and the use of logarithms, botany, geology, chemistry, physics, German or French, English, and political economy.

Curriculum.—The regular course covers a period of two years. The subjects have been so arranged that nearly all the preliminary work is completed in the first year. Enough technical forestry is, however, taught in the first year to enable the students to make sylvicultural studies, to investigate the growth and production of trees and forests, to establish forest plantations, and to make thinnings and other classes of cuttings. The second year is devoted to advanced technical work in the class-room and in the field.

Courses of Instruction.—The following are the lectures in the two years' course, the figures in brackets indicating the number of hours occupied by the lectures:—

First Year, First Term.—Introduction to Forestry (3), Sylviculture (3, and field work), Forest Measurements (2, and field work), General Morphology of Plants (laboratory work and informal lectures, 4), Forest Botany (lectures and laboratory work, 2 to 4, and excursions), Mineralogy (laboratory work, 4 hours), Zoology (2).

Second Term [First Half].—Sylviculture (3), Forest Measurements (2, and field work), General Morphology of Plants (laboratory work and informal lectures, 4),

Appendix XXIX.

Forest Botany (lectures and laboratory work, 2-4, and excursions), Elementary Petrology (1), Zoology (1), Meteorology and Forest Physiography (4), State and National Forestry (4 to 6 special lectures), Forest Hydrography (4 to 6 special lectures). [Second Half.]—Sylviculture (3, and field work), General Morphology of Plants (laboratory and informal lectures, 4), Forest Botany (lectures and laboratory work, 2-4, and excursions), Origin and Nature of Soils (1), Zoology (1), Surveying and Field Engineering (field and class-room work, 4-8).

Second Year, First Term.—Forest Management (4, and field work), Forest Technology (lectures and laboratory work, 2-4), Lumbering (2), Forest Protection (1), History of Forestry (1), Diseases of Trees (2).

Second Term [First Half].—Forest management (4, and field work), Forest Technology (lectures and laboratory work, 2-4), Lumbering (2), Forest Protection (1), Forest Entomology (2), History of Forestry (1), Forest Administration and Law (1), Forest Roads and Trails (1). [Second Half].—Field work in Pennsylvania, in the Adirondacks, and in the White Mountains.

Summer School of Forestry.—This is located at Milford, Pa. The purpose of the summer school is to provide instruction for those who do not wish to take, or who are not ready for, the more advanced technical courses at regular forest schools. The course is designed for :—

(1) Owners of woodland (farmers, lumbermen, and others who wish to obtain a knowledge of the principles of forestry and a practical acquaintance with the care of woodlands, and with tree planting, will receive instruction to meet their special requirements) ; (2) forest rangers, the course being particularly adapted to those who wish to fit themselves for work as such ; (3) teachers (instruction in forestry is now given in a considerable number of agricultural colleges, industrial schools, and other institutions, both in connection with the study of horticulture and as separate courses, and it would, doubtless, form part of the instruction in botany and nature study in public and private schools, if the teachers were properly qualified) ; (4) students of forestry who are deficient in certain subjects ; and (5) all persons who desire to acquire a general knowledge of forestry, or any of its branches. Opportunity is also provided for advanced students to carry on special forest work.

The summer school of forestry is equipped with a school-building, containing a large hall and three smaller rooms, two of which will be used as laboratories, and the other as a library and reading-room. For practical instruction in the field Mr. Pinchot has given a tract of about 60 acres of woodland, and also considerable open ground for tree planting. One of the Pennsylvania State Forest Reservations is but a short distance from Milford, and will be available for study, as will also other forests in the immediate neighbourhood. Tents will be furnished by the school for those who desire to live in camp.

There is no entrance examination, but candidates must be at least 17 years of age. The school is open to women. The term commences, in 1902, on July 1st, and continues eight weeks. The fee for a single session is $25 (about £5 4s.). Five regular courses are offered ; students may take any or all. They are : Forest Botany, Sylviculture, Forest Measurements, Introduction to Forestry, and Forest Protection. Practical work in the woods will form an important part of the instruction.

Number of Students.—The list of students in attendance at the Yale Forest School in 1901-2 comprised 10 second year and 21 first year students ; and the number in attendance at the summer school in 1901 was 27.

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ABERDEENSHIRE County Council Lectures.—Bailey, 335, 387–9; Somerville, 2990–2, 3099–113.

ABIES NOBILIS.—Ramsden, 612–4.

AFFORESTATION: (*a*) *Areas available for.*—Margerison, 268–70; Bailey, 335, 350–6, 364–5, 491–4, 498–9; Selborne, 511–3, 587–8; Slater, 750–4; Havelock, 981; Forbes, 1366–9; Robertson, 1594–5, 1686–8, 1745–8, 1872–8; Davidson, 2063–5; Vernon, 2087, 2217–25; Schlich, 2267–70, 2293–4, 2299–307, 2358–61, 2451; Drummond, 2477, 2569–70, 2578, 2584–5; Somerville, 3002, 3063; Webster, 3225–6, 3233, 3237–40; Michie, 3475–7; Ward, 3509; Parry, 3689–90; App. I., II. (ix., xi.), III., X., XXII.

(*b*) *Compulsory re-planting.*—Margerison, 262; Drummond, 2588–9; App. III., XXVI.

(*c*) *Desirability of State afforestation.*—Bailey, 452–3, 504–5; Selborne, 587–8; Ramsden, 736; Slater, 811–4; Havelock, 982–8; Forbes, 1211–3; Glanusk, 1383; Robertson, 1866–71, 1896; Davidson, 1912–3; Vernon, 2110, 2217–9; Schlich, 2269, 2293–4, 2302–7, 2331–6, 2361–9; Drummond, 2487–8, 2569–70; Webster, 3188, 3197–9, 3207, 3225–9, 3239; Michie, 3480–1; App. II. (viii., xiii.), VIII.

(*d*) *In foreign countries.*—App. XXV., XXVI., XXVIII.

(*e*) *Would provide employment for labour.*—Margerison, 89–92; Bailey, 335; Robertson, 1612–4, 1814–25; Davidson, 1915, 2004–27; Vernon, 2220–1; Michie, 3421–37, 3471–4; Parry, 3643, 3664, 3692–4.

AGRICULTURAL RATES ACT.—Ramsden, 641–2, 692; Maxwell, 2850–62; App. XII., XIX.

ALICE HOLT WOODS, Area under wood.—App. XXI.

ALSACE LORRAINE, Area and finances of State forests.—App. XXVII.

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Evidence on behalf of.—Davidson, 1897–2072.

———————— ROYAL SCOTTISH.—Slater, 821–5; Robertson, 1662, 1673–7, 1855–8; Somerville, 3060–1; App. II. (iii., iv., vi., vii.).

Evidence on behalf of.—Robertson, 1581–896.

AREA: (*a*) *under woods in Britain.*—Craigie, 2904–8, 2929–32, 2954–66, App. XIV., XXI.

(*b*) *Of State woods in France and Germany.*—App. XXVII.

ARGENTINA, timber supplies.—Schlich, 2262, App. II. (xi.).

ASH: (*a*) *Increasing scarcity.*—Margerison, 49–54, Hopton, 330.

(*b*) *Prices.*—Havelock, 1049–50, App. VI., App. IX., App. X.

(*c*) *Profitableness.*—Margerison, 81, 164–70, 271–91; Havelock, 1092–3; Vernon, 2106; Schlich, 2432.

(*d*) *Quality.*—Margerison, 247–50; Hopton, 325–7, 329; Croxford, 2731; App. III.

AUSTRALIA, timber supplies.—App. II. (xi.).

AUSTRIA.—Bailey, 423; Schlich, 2259, App. II. v., xi.), XXV, XXVI.

AUSTRIAN PINE for shelter belts.—Bailey, 399–402, App. I.

BAILEY, LIEUT.-COL. F. (Analysis of his Evidence).—Has been Director of the Forest School in India, and in charge of the English students at Nancy; is lecturer on forestry at Edinburgh University and editor of the Royal Scottish Arboricultural Society's Transactions, 332–4. Woods in Scotland are insufficiently stocked, principally owing to over-thinning, and the sylvicultural methods commonly practised do not result in the production of a remunerative class of timber, 335. Woods are chiefly grown for game preserves or for amenity, 335. Owing to irregular working the regular supplies of suitable material cannot be ensured in this country; all profit-earning woods should be managed under a settled plan, plan, in the absence of which both money and time are wasted, 335. Financial results are not satisfactory, but the results hitherto obtained from improperly-managed woods are no guide to what could be done with good management, 335, 366. Our climate is very suitable for growing trees, 335, 393. We have no forests which have been managed so as to show the results of correct working, 335. Two or three model State forests are urgently required to serve as examples and for the conduct of experiments, 335, 339, 382–6, 470–1, 502–7. A course of lectures on forestry has been given for the past 12 years at Edinburgh University, the total attendance in the past ten years being 76, 335. During 1901–2 there were 91 class-room lectures and 18 hours work in the field, 335. A forest garden in the immediate vicinity of Edinburgh is also wanted, 335, 383–6, 418–9. 507. Witness has given lectures on forestry for the Aberdeen County Council, 335, 387–9. Large areas of waste land in Scotland might profitably be planted, 335, 350–6, 364–5, 491–4. Every 1,000 acres of added forest would provide work for about 15 men, 335. The supplies of timber from abroad are becoming exhausted, 335, 371–2, 408–14. There is a general desire for instruction among foresters in Scotland, 336–8. If there were to be only one State forest, Edinburgh would be a suitable centre, 339–42. A separate forest school would require a large staff, whereas at a university it would be much simpler to provide instruction in forestry; we should begin by organising instruction in forestry at a university, 342–3. It is desirable to have more than one State forest, on different classes of land, 344. A forest garden is wanted at each centre of instruction, besides a model forest which might serve several centres, 343–8, 382–6. The landowner and agent require education in the first instance, before the forester, 349. A small commission should be appointed to ascertain what land might be afforested, 354–6. A model forest is wanted in which to take the students to show them how trees properly managed are growing, 357, 470–1. The want of this is seriously felt in Edinburgh, 357. Instruction is necessary for the development of colonial as well as a home forestry, 358. We should start by concentrating our efforts upon a single centre, 359. The Government should buy an estate in Scotland, and affiliate it to Edinburgh University, 360. The model forests should be under the Board of Agriculture, 361. The size should be 1,500 to 2,000 acres, costing not more than £40,000. 362. The revenue would at first be small, but it should, when in order, yield not less than £1,000 per annum, 363. Forestry is an optional subject for the degree of B.Sc. at Edinburgh, 367. The students attending witness's lectures are probably men looking out for factorships, or who are going to farm, and eldest sons of proprietors, 367; not many foresters, 461–2. In 1891–2 no fees were charged and the attendance was about forty, 335, 368–70. The quality of imported timber is falling off, and some of it is now railway borne 335, 371, 437–45. The uses of timber are increasing, 372. Large areas of forest in America have been burnt to

make clearings, 372. More precautions should be taken against fires in this country, by apparatus on engines and by owners planting suitable belts near the railways, 373. Suitable well-rooted trees should be grown on the outsides of forests to minimise damage by wind, 373. Woods managed on the continental system are not more unsightly than others, 374–8. Land is often left bare after felling for a few years probably to get rid of the weevil; bu there is great loss under this system 379. Vacancies due to the death of young trees during the first few years ought also to be filled up, 379–81. County Council lectures once a week at a centre during the winter might be of advantage, 390–2. Natural regeneration of Scots pine and larch is very successful in Strathspey, 393–5. A railway company was unable to place an order in Scotland for 100,000 sleepers of Scots pine, 335, 396–8. Mountain pine, Austrian pine, Corsican pine, and silver fir are often good shelter trees to plant outside the woods, 399–402. There is no scarcity of labour in Scotch forests, 404; agricultural wages in Scotland are higher than in England, 405. Death duties are a difficulty in the way of planting, 406–7. We have to look to temperate countries as the main source of our supplies, 408–14. We must have model forests as the only way of exciting interest in planting among owners and trustees, 414–7. The forest garden would only be used for the study of forest botany and as a sort of nursery, 418. The model forest should be more or less under wood to start with, 419–20. It would be a good thing to interest landed proprietors so that they should allow their woods to be used for instruction, 419–24. Co-operation among landowners to form a forest school, as in Austria, is not probable in this country, 423. A higher class of instruction should be given at Edinburgh, while instruction should be given by a competent manager in the model forest to the working foresters, 425–32. Forestry ought to have a much more prominent position at Edinburgh, so as to give a complete education in forestry, not only for this country, but also the colonies, 433–6, 482. Witness has given evening lectures at the Heriot-Watt College, 433. Imported timber from the Baltic and Canada is falling off in quality, 437–40. The deterioration in quality shows that the supplies are becoming exhausted, 441–2. The manufacture of paper from wood-pulp is an important factor in diminishing stocks of timber, 443–4. Not much replanting is being done in America, 445–8. The State model forest should not be less than 1,000 acres, 450–1. The State should acquire waste land for afforestation, 452–3. In Hungary the State possesses a large forest area, and has a good school, 454–7. The increased revenue from Indian forests is due to better working of the forests, 459–60. The salary of foresters is not sufficient to justify their attending university courses, 461–7. When proprietors realise the value of their forests, the salaries of foresters would increase, 467. At first the foresters should be trained in the model forest, and there should be class-rooms in the forest, 467–71. Itinerant advisers in forestry would be of some use, but would not meet the case, 472–6. Large woods are a very valuable property, and to manage them properly require a man who has been highly trained, 477–9. It will be some time before we get fully trained men, and planting must be done before that, 479–81. Many old woods in Scotland carry only a light stock of timber, 482*–5. Students must carry on outdoor work concurrently with instruction by lectures, 486–90, 494. Some land in Great Britain is at too great an altitude to be planted, 495–7. The existing area under wood in this country could be more than trebled, 498–9. Peat land is suitable for planting, 500–1. Private enterprise will not cover all the land available for timber, 504; if the State makes a start others will follow, 505. A site should be chosen for the model forest so as to show the greatest possible number of demonstrations, 506.

(*Recalled.* 6th May.)—A regular working plan, with account and control books showing the receipts and expenditure, and that the provisions of the working plan are being properly carried out, is indispensable to profitable management, 2782–5, 2823–4. The working plan lays down what areas are to be felled every year for some twenty years ahead, and books should be kept to show whether this is done as prescribed, so that any deviation from the plan due to storms, etc., can be adjusted next year, 2786. The cash-book shows exactly the receipts and expenses for each wood, with a summary for the whole area, 2786. It is impossible to give instruction in forestry without an area for practical demonstration, 2787–8. This area must be properly managed to pay financially, 2788, 2792, 2796. Students cannot b taught sylviculture in a wood when sylviculture is not properly carried out, 2788, 2797–9. Such a forest should be 1,000 to 1,500 acres, near Edinburgh, with varied conditions of altitude, etc., 2789–90. The professor at Edinburgh should have control over the work of the forest, as on the continent, otherwise friction may arise, 2791. Witness cannot name any particular area, but one may be acquired, 2793–5. There are plenty of woods where students may see the result of bad work, 2798, 2802. There might have to be more than one area, if all varieties of soil, etc., could not be secured on one area, 2800–1. An area for experiment would be included in the instruction forest, 2803. The forest should be within easy reach of the college, 2804–6. Landowners and agents should be trained at the university, otherwise the cost of separate professors would be too high, but foresters in the forest, 2806–7. A demand for a spearate forest school might arise ultimately when owners pay their foresters at a higher rate, 2807. Very few accounts are kept, owing to lack of interest, 2808–10. There would be no difficulty in drawing up plans for existing woods, 2811–8. There is need to train men who could draw up working plans, 2819–20, 2827. It would be desirable that land acquired for a demonstration forest should have trees upon it to begin with, 2821–2, 2828–30. A well-conceived plan of forest book-keeping prevails in the forests of India, 2825–6.

Appendix II. :—(i.) Forestry in France; (ii.) Forestry in Hungary; (iii.) President's Address, Royal Scottish Arboricultural Society, 1899.

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BALFOUR, I. B.—President's Addresses, 1891 and 1892, to the Royal Scottish Arboricultural Society, App. II. (vi., vii.). Forestry, in Britain, Address to British Association, 1894, App. II. (viii.).

BALTIC timber.—Bailey, 437–40; Schlich, 2259; Croxford, 2760–5; Michie, 3438, 3452; Roberts, 3735–9, 3743–8; App. II. (xi.), XVIII.

BARRES: (*a*) *Forestry School.*—App. II. (i.).
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BAVARIA: (*a*) *Area and finances of State forests.*—App. XXVII.
(*b*) *Legislation regarding woodlands.*—App. XXV. XXVI.
(*c*) *Programme and regulations of Lower forestry schools.*—App. XXIV.

BEECH: (*a*) *Growth of in Bucks.*—Ramsden, 656–62; Vernon, 2073–256; App. IX.
(*b*) *Importation.*—Hopton, 318–21; Vernon, 2116–8, 2209–10.
(*c*) *Prices.*—App. VI., IX., X.
(*d*) *Quality of home and foreign.*—Margerison, 69–71, 93–105; Hopton, 322; Vernon, 2242; Croxford, 2731–2; App. III..

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BIRCH: (*a*) *Imported for the chair industry.*—Vernon, 2206.
(*b*) *Prices.*—App. VI., IX., X.

BIRDS.—Margerison, 296–9; Selborne, 549–50; Somerville, 3132.

BIRMINGHAM Corporation waterworks.—Glanusk, 1528–30.

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(*b*) *Powers with reference to loans for planting.*—Drummond, 2579–83; Craigie, 2887–903; 2915–28, 2933–42; App. XIII.
(*c*) *Publication of information.*—Forbes, 1183–5, 1235–47; Drummond, 2567–8; App. II. (viii.), VIII., X.

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BOPPE, M., opinion on English woods.—Bailey, 357 ; App. I.

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BOUNTIES for afforestation.—Drummond, 2506–7 App. X., XXV.

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(*b*) *Evidence on behalf of University.*—Ward, 3492–641.

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CANADA : (*a*) *Importation from.*—Bailey, 437–42 ; Vernon, 2206–7 ; Schlich, 2258, 2262–4 ; Croxford, 2738, 2745–8, 2755, 2769–71 ; Michie, 3356 ; App. II. (xi., xiii.).

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CLIMATE, suitability for growth of timber of English. —Margerison, 39–41 ; Bailey, 393–4 ; Robertson, 1665 ; Schlich, 2273, 2378–9 ; Pitcaithley, 2703 ; App. I., II. (ix.), III.

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COLONIES, demand for foresters —Bailey, 358 ; Schlich, 2274 ; App. XX.

COMMITTEE, suggested appointment of.—Bailey, 354–6 ; Schlich, 2270, 2361, 2451 ; Somerville, 3064–5 ; App. VIII.

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(*b*) *Relative advantages of conifers and hardwoods.*—Margerison, 164–5, 284–91.

(*c*) *Supplies of coniferous timber.*—Margerison, 109–10 ; Schlich, 2259–65 ; Croxford, 2780–1 ; App. II. (xi.).

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CO-OPERATION : (*a*) *Among landowners to provide instruction.*—Bailey, 423 ; Forbes, 1308–11 ; Schlich, 2295 ; App II. (v.), XXV.

(*b*) *Forest societies.*—App. II. (xiii.), XXV.

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CORNELL UNIVERSITY, instruction in forestry.—App. XXIX.

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COUNTY COUNCILS, Instruction and assistance given by —Bailey, 335, 387–92 ; Forbes, 1302–7, 1336–8 ; Somerville, 2990–7, 3005–22, 3049–59, 3076–8, 3099–122 ; 3133–6.

CRAIGIE, MAJOR P. G. (Analysis of his Evidence.)—Is Assistant-Secretary to the Board of Agriculture. The Board of Agriculture's policy as regards loans is stated by Mr. Elliott in the evidence before the Royal Commission on Agriculture, 2887–8. The original policy of the State was to make advances for the drainage of land, but the system has subsequently embraced other matters, 2888. The loans are very little taken advantage of for planting, 2889, 2898, 2933, 2937–8 ; because there is no immediate return to the owner, while there is an immediate charge for interest and redemption, 2889. Advancing money on other terms would be difficult, 2890–1. It is doubtful whether the timber could be legally mortgaged separately, and Mr. Forbes' scheme presents great administrative difficulties, 2892–6. A longer period might be allowed for the repayment of loans, which would lower the annual charge for redemption, 2897–8. In 1899 the period of repayment was extended from 25 to 40 years, 2899 ; and loans already made for 25 years can be extended to 40 years, subject to the planting being inspected, 2899 ; no advantage has been taken of this last provision, 2936, 2940. Expenditure in connection with such loans on forestry would have to be very carefully supervised, 2900–3, 2941–2. Statistics of the area under woodlands are obtained at intervals, 2904. There is no official definition of woodland, 2905–2909. The apparent increased average of woodlands is probably due to greater exhaustiveness in the returns, 2906. The Ordnance Survey ascertains the area by a survey on the ground, 2907 ; they show different kinds of woods differently. but a summary of their data would be difficult and costly, while the particulars relate to varying dates, 2908, 2966. Grants in aid of agricultural education are only given when local support is also forthcoming, 2910–11. The State pays annually about £8,000 directly through the Board of Agriculture for agricultural education, 2912–3, 2967–9 ; but about ten times that amount is also devoted to the same purpose out of the sums provided by the Local Taxation (Customs and Excise) Act, 2912–3. No special grants are made for forestry education, but some of the institutions receiving grants teach forestry, 2914, 2969–74. A landowner wishing to borrow money from the State for planting

applies to the Board of Agriculture, or one of the Land Improvement companies; the site is inspected by one of the Board's Inspectors, and, on the latter approving, a provisional order authorising the expenditure is issued; the work is again inspected on completion, and an absolute order issued creating the charge on the estate, 2915–9. The inspector roughly estimates the cost, 2917. The owner borrows the money from a land company, or may provide it himself, 2920. Landowners can, under the Settled Land Acts, use capital in the hands of trustees for planting, 2920. The period of the loan is determined by the Board of Agriculture, 2921–2; the loans being cleared off during that period, 2934–5. No supervision is exercised after the loan is sanctioned, 2923, 2941–2 Generally the companies, when they get the charge, sell it to an insurance company, 2923, 2940. The principle of the loans is that the estate should be benefited, 2924. A sufficient area of the estate is mortgaged to justify the charge, 2925. It is possible that the plantations thus formed may be neglected, 2926–7. The total sum spent on planting under the system in 50 years is less than £100,000, 2927. It would require a very large area of woodland to form security, but the woods may generally be kept up in some form and the loan is secured, although there might be neglect of the timber value, 2928. On the Ordnance Survey maps woodland is measured as wood when enclosed, 2929. Some of the land which has gone out of arable cultivation has been planted, 2930–2. There have been only nine applications for planting since the Act of 1899, 2933, 2937. The land companies know that the loans can be obtained for planting, 2939. Plantations improve the value of an estate beyond the actual value of the wood, 2924, 2943–4. Gorse land is probably not included in woodland, 2945–7. Land may be planted for fox coverts or for sport, 2947–53. The Board of Agriculture's returns of woodland are independent of the Ordnance Survey, 2954–5, 2962; although occasional reference in case of doubt may be made to the maps, 2954. Woodlands and plantations are now separately distinguished, 2905, 2957–60. It is uncertain whether land which has been cleared of its timber but not replanted would be included among woodland, 2960. The Board of Agriculture hope the Committee will give a definition of woodland, 2909 2956, 2961. Foreign methods of collecting the statistics of woodlands differ very largely, 2962–4. There are not many students of forestry in this country, 2972–4. The demand for agricultural edutcation has greatly increased of late years, 2977–81; it does not follow that an increase in planting would result from increased means of education, 2982–6.

Appendix XIII.—Note on the Board of Agriculture's powers with reference to loans for planting; App. XIV.—Returns of Woods.

CREOSOTING.—Margerison, 182; Havelock, 879–80, 911–4; Roberts, 3740–1, 3749–50; App. VII., XVIII.

CROWN WOODS.—Forbes, 1345–8, 1361–5; Robertson, 1596–7; Schlich, 2279–84, 2293, 2296–8, 2321–2; App. I., XXI.

CROXFORD, J. H. (Analysis of his Evidence.)—Is a member of Messrs. Price, Walker, and Co., timber importers, Gloucester, 2727–9. English timber cannot compete in quality or price with the bulk of imported timber for building, 2730, 2733. English oak, ash, beech, and elm, are superior to foreign, 2731; none of these are in sufficient quantity to supply the home market, 2732. Foreign timber of some classes will, owing to scarcity, some day be more expensive than English, 2734–5, 2757–9. There is no falling off in the quality of foreign timber, 2735, 2755–6. The home demand is increasing, 2736. The price of foreign timber is gradually rising, 2737, 2756. No English timber can compete with Canadian spruce for cheapness at present, 2738, 2745–8. Foreign timber is carried by rail at lower rates than English, and is handled easier, 2738, 2751–4. Terminal charges are also much less, 2753–4. Witness imports his timber dressed, 2739. English saw mills are, as a rule, up-to-date, 2740–1. The practice of importing wood manufactured as compared with the round is increasing, 2743. It will be possible to grow more timber at home, especially of the slow growing woods, 2744. Witness does not import larch, only timber that competes with it, 2745. English purchasers consider only the cost, not the durability, 2747–9. Much foreign wood is artificially seasoned, 2750. Less Ottawa pines come in than formerly, 2755. Witness imports spruce, 2738, 2745, 2760–4. French timber is imported cut ready to go in to the pits, 2762. The timber witness imports is all dressed, 2762–5. Witness has not noticed any falling off in the dimensions of the big logs imported, 2766–8, though the diameter of Canadian white pine logs has fallen off somewhat, 2769–71. The gradual increase in cost is due to much of the timber being cut at a distance from the ports, 2767, 2772. The foreigner puts his goods on the market here, and knows his business better than the home people, 2773–5. Witness's partner has tried planting in Gloucestershire, but stopped because his plantations, on land not worth 2s. 6d. before, were assessed at 10s. per acre, in addition to the agricultural rates of 1s. 3d., 2775–9. There is a timber famine ahead, in both coniferous and hard wood, 2780–1. There is a great deal of felling and very little planting of the slower growing trees in England, 2781.

DAVIDSON, J. (Analysis of his Evidence.)—Is Secretary to the English Arboricultural Society, and manages the woods on the Derwentwater property in Cumberland, 1922–3, 1935. The English Arboricultural Society give a certificate for forestry, which is not much taken advantage of, 1897–9, 1948–57. The excursions of the Society are instructive, 1900–1. Forestry is holding its own in point of area, and more interest is being taken in it, 1902–6, 1939–40. A well-grown wood will always give a return, 1907–9. Forestry is not on a business footing now, 1910–11. There should be State forests; the existing area will not be much extended by private owners, 1912–3. One or more of these State forests should be available as a demonstration area, 1914. The extension of the forest area would help to maintain a country population on the land, 1915, 2004–27. Timber can be grown up to quite 1,800 feet on the Derwentwater property in Cumberland, 1916–21. On the Derwentwater property, the timber is felled when ready, and the land is being planted, 1922–9. Proprietors might plant if loans were granted by the State, subject to inspection, 1930–3, 2027–31. The English Arboricultural Society has increased very much since it was founded 21 years ago, 1935–42. The Society will make an excursion to France this year, 1943–6. Acquaintance with continental methods would be an advantage to English forestry, 1947. The examinations of the Society are practical as well as theoretical, those of the Highland Society only theoretical, 1948–57. Education is best given in an experimental forest with a school there, 1958, 1969. State forests should be run on practical lines, and illustrate the various systems, 1959–62. An area of not less than 4–5000 acres is required, with variety of soil, aspect, &c., 1963–8. Working foresters would have to be helped with scholarships 1970–2. It would be a good thing if the students could at the same time earn wages in the demonstration forest, 1973–7. The Northumberland County Council have provided classes for working foresters, 1978–80, 2059–62; the attendance at these was satisfactory, 1981–5. Such a system might be extended, 1986, 2001–3. The Northumberland County Council have also experimental forestry plots, amounting to about 10 acres, on their experimental farm, 1986–96. Other County Councils with similar agricultural farms should set apart plots for forestry experiments, 1997–8, 2001–3. County Council scholarships for forestry might also be given as in Northumberland, 1999–2003. Pastoral hill land in Northumberland carries about 1 sheep on 2 acres, the rent runs to about 2s. per sheep, or 1s. per acre, with about 1 shepherd to 1,000 acres, 2004–20. To put this land under woods would not interfere very greatly with sport, 2014–5. The labour on land stocked with trees costs about £5 per 20 acres annually, so that it takes about 200 acres of forest land to maintain one man with his family, 2021–5. So that land under forest maintains five times as many men as that under sheep in Northumberland, 2026–7. The State already provides facilities for borrowing money through the land improvement companies, but their rate of interest is too high, 2028–30. Corporations should plant the catchment areas of their water supplies, 2032–3; they generally remove all inhabitants and live-stock to prevent

contamination, and so leave the area unutilised, 2034–7; while planting these areas would improve the supply and purity of the water, 2038–42. There is too little planting generally in England, 2043–8. Timber can be grown profitably on land which will not pay otherwise, 2049. The market value of residential estates is increased by being well wooded, 2050–2; so that apart from the value of the timber, planting forms a good investment for trustees. 2053–4. The value of adjoining agricultural land is also improved, 1921,2054–7. With plantation in the neighbourhood tenants know that their fences will be kept up by the proprietor, and will pay a better rent, 2057. In the neighbourhood of towns plantations, when they are up, add to the value of building sites, 2058. The examinations of the English Arboricultural Society are mostly attended by men working in woods, 2058–9. Parts of North Wales might advantageously be afforested, 2063–5. Foreign stocks of timber are being depleted, 2066–8. Prices have gone down in the past forty years, 2069–71; though there has been a rise lately, 2072.

Dean Forest.—App. I., XXI.

Death Duties.—Bailey, 406–7; Selborne, 590; Forbes, 1354–7; Minchin, 3142–86; App. I., XV.

Deer, injury by.—Ramsden, 695–8; Schlich, 2336*; Michie, 3394; App. XI.

Deer Forests.—Ramsden, 710–7; Michie, 3482–91.

Deforestation, legislation concerning, in foreign countries.—App. XXVI.

Degrees or Diplomas.—Bailey, 367; Davidson, 1897, 1948–53; Schlich, 2263; Somerville, 2994–5, 3056–9. App. I., XXIII., XXIX.

Dehra Dun Forest School.—Bailey, 357; App. I.

Demonstration Forests, State: (*a*) *Necessity of.*—Bailey, 335–44, 357, 382–6, 414–24, 450–1, 470–1, 502–6, 2787–807; Selborne, 564–7, 589; Ramsden, 622–4, 706–9; Slater, 742–6, 763–81, 826–7; Havelock, 890–7, 913, 1037–41, 1080–5; Forbes, 1151–60, 1226–30, 1261–5, 1290–8, 1339–44, 1358–60; Glanusk, 1396–400, 1475–8; Robertson, 1586–604, 1677–9, 1689, 1859, 1889–93; Davidson, 1914, 1958–69; Vernon, 2111–2, 2147–50, 2194–5; Schlich, 2274, 2280–94, 2310–9, 2363–4, 2381–6, 2402–11; Drummond, 2555–9; Pitcaithley, 2655, 2698–9; Somerville, 3041–7, 3079–81, 3137–41; Michie, 3315, 3328–9, 3334–47, 3366–76, 3380–1; Ward, 3496; App. I., II. (iii., iv., v.), XI., XXII.

(*b*) *Control of.*—Bailey, 360–1, 2791; Robertson, 1738–44; Schlich, 2317–20, 2402–4; Ward, 3514–7.

(*c*) *Suggested localities.*—Bailey, 339–42, 360, 2789–95; Slater, 862–4; Robertson, 1600, 1666, 1782–3; Schlich, 2279–88; Pitcaithley, 2633–5; Michie, 3315, 3340; Ward, 3521–4.

(*d*) *Forest school in.*—Bailey, 342–3, 423, 469–71, 2807; Slater, 742–6, 862–4; Havelock, 1081–5; Forbes, 1299–301; Robertson, 1718–44, 1888–93; Davidson, 1958, 1969; Schlich, 2274, 2350–2; Pitcaithley, 2644–50, 2663; Somerville, 3043–6; Webster, 3188, 3197–9, 3207, 3255–7; Michie, 3315, 3328–9, 3334–47, 3380–1; Ward, 3630–5; App. I., II. (iv.), X.

Depopulation, rural, prevention of.—Margerison, 89–92; Selborne, 593; Robertson, 1807–25; Davidson, 1915, 2004–27; Vernon, 2153–8; Michie, 3421–37, 3471–4; Parry, 3643, 3664, 3679–85, 3692–4.

Douglas Pine.—Ramsden, 612–4; Forbes, 1335; Glanusk, 1415–6; Schlich. 2428–32; Drummond, 2497; Michie, 3451; App. I.

Downton College of Agriculture.—Drummond, 2468, 2612–8; App. I.

Drummond, D. W. (Analysis of his Evidence.)—Manages estates of 80,000 acres, with 3,000 acres of woodland, in South Wales, 2453–6. Has studied at Cambridge and Downton, 2455, 2467. Would have derived benefit if there had been adequate provision for forestry instruction at Cambridge and Downton, 2457–8, 2550–4; and has felt the want of a thorough training in sylviculture, 2459–60. Owner, agent, and forester should all be trained, 2461–2; the agent in the first place, 2463, 2549. Foresters are not sufficiently educated, 2464–6. There was very little forestry training at Downton, 2468, 2612–4 There is not much to be learnt from the New Forest, 2468. The price of wood is low in South Wales, 2469; partly from expensive transport, 2470. Traction traffic on roads has not been tried, 2471, 2474. There is much foreign competition in pitwood (pinaster) from France, 2472–3. Several of the woodlands in South Wales have been planted for commercial purposes, 2475; but in too small areas, 2476. There is a large area of waste land in the west of Wales, partly belonging to the Crown, which could be properly planted, 2477, 2569–70, 2578. Grazing rights are a difficulty, 2478, 2503–5, 2531–9, 2592–609. Landowners will not plant without some encouragement, 2479–80. Some assistance in the rates should be given, 2480–1. Rates and taxes are between 7s. and 8s. per acre, 2482–3. Landowners want evidence that planting will pay, 2483–4. Proper book-keeping of the plantations is not kept, 2485–6. The State should undertake planting, 2487–8, 2569–70. A good course in sylviculture at the university would be a great advantage, 2489, 2550–9. A practical training is very important, 2489–92, 2554–9. Larch disease has been very serious in South Wales, but they are recovering, 2493. Witness mixed larch with Scots fir or *Laricio*, 2494–7. Spruce does very well in his county, 2497. Foreign pitwood comes in at 6s. to 7s. per ton, 2473, 2498. Larch fetches a better price than foreign wood, but the latter comes prepared exactly to suit the market, 2499. Plantations should be relieved from rates until the returns begin to come in, 2500–2. The sheep are of a very inferior class, 2505. A Government bounty would conduce to planting, 2506–7. It is very difficult to get labour in South Wales, 2508–11, 2591. Nurserymen will take a contract for planting, but it is better to employ one's own men, 2509–11. Fencing costs about 1s. per yard, 2512–3. Fencing is correctly charged to the forests, 2513. It is difficult to keep the sheep out of the woods, 2514–5. Timber would be more profitable than grazing in South Wales, 2516–7. Tenants would also gain by the shelter, if certain areas were taken into forests, 2517, 2599–603. Coal is exported from Carmarthenshire in French vessels, which bring in pitwood as ballast on the return journey, 2518, 2565–6. The plantations suffer from excessive rainfall, 2520–2. The pitwood grown locally is chiefly larch, 2523–4. More spruce might be planted with advantage, 2525–30, 2560–3. A good deal of spruce is imported, very much for building purposes, 2526–9. The grazing rights are not an insurmountable difficulty, 2531–9, 2603–9. Liverpool cleared its waterworks area entirely of the grazing rights, 2536–8. There is great mismanagement in South Wales, 2540–2, 2590. Felling areas are replanted as quickly as possible, to conserve the fertility of the soil, 2543–6. Our knowledge of forestry is behindhand, 2547–8. Students at the universities and colleges might get their practical training abroad until we had the necessary instruction areas in this country, 2555–9. Larch makes the best pitwood because it will stand a much greater strain than other woods, 2563. Spruce is better than pinaster for pitwood, 2564. The Board of Agriculture should publish pamphlets on forestry and an elementary handbook, 2567–8. There are very few plantations above 800 feet under witness' management, 2571–2. Railway rates are high, but witness cannot speak as to any preferential rates, 2573–5. Local authorities place difficulties in the way of traction haulage, 2576; and make claims for extraordinary traffic, 2621–3. There is not much trouble with game in South Wales, 2577. The Land Improvement Companies' loans are not taken advantage of for forestry, 2579–83; witness has not met with a single case during the 11 years he has been Inspector under the Board of Agriculture, 2579–83. By "waste land" witness means the unenclosed mountain land, 2584–5. There is no increase in forestry in South Wales, 2586–8. The

Government should take some steps to call attention to the subject, 2568, 2588. Owners should be obliged to replant as much as they cut down, 2589–9. Witness plants as much of the unproductive areas as he can on the estate under his management, 2590–2. The tenants of farms in the valleys have grazing rights on the hill land, which often belongs to a different owner, 2531–3, 2592–2609. Instruction in forestry would be better given in connection with the agricultural colleges than at a university, 2610–1. Some instruction on subjects connected with forestry is given at Downton, but forestry lectures were introduced since he was there, 2612–8. It would be a great advantage if these colleges had an area for practical instruction, 2615–6. Practically all the rough ground in Wales is subject to grazing rights, 2619–20. The agent is responsible to the owner, but as he cannot know everything the head forester is important, 2624–7. Many farms in South Wales do not pay a rent equal to the interest on the fixtures, 2628. Witness would not plant land bringing in 10s. or more per acre, 2629.

Appendix X.—Particulars of estates managed by witness, trees planted, prices, markets, railway rates, local taxation. Much waste land might be afforested, and areas filled should be replanted. No hard woods are being planted in South Wales, as larch and conifers give a much quicker return. The Board of Agriculture should issue publications. Training of foresters is a necessity. Rates on woodlands should be remitted, or a bounty given. There should not be a separate State school of forestry, but education should be given at the agricultural colleges and universities. An 18 months' course should be given, as well as short courses of three months.

DUNES, afforestation of.—App. II. (xiii.), XXVI.

DURHAM College of Science.—Somerville, 2994, 3056, 3066–9.

EDINBURGH: (*a*) *University.*—Bailey, 335, 360, 367–70, 461–2, 2789–91; Slater, 859–64; Robertson, 1738, –44; Somerville, 3114–5; App. I., II. (iv.), XXII.

(*b*) *Botanic Garden,*—Slater, 782, 857–8; App. II. (vi., vii.).

EDUCATION: (*a*) *Foresters and Woodmen, existing facilities for training.*—Bailey, 335, 461–2; Slater, 782, 857–8; Havelock, 916–7, 964–6; Forbes, 1266–72; Robertson, 1721–6; Pitcaithley, 2651–4, 2664–5; Somerville, 2990–6, 3005–8, 3049–54, 3099–113, 3133–6; Webster, 3193–4; Michie, 3361–6; App. I., II. (vi., vii.).

(*b*) *Foresters' requirements.*—Margerison, 37, 125–36; Bailey, 335–8, 349, 425–32, 467–71, 2806–7; Selborne, 576–8; Ramsden, 608, 646–8; Slater, 742–6, 771–89, 815–27, 841–64; Havelock, 952–70, 1015–8, 1076–85; Forbes, 1142–60, 1186–8, 1218–30, 1273–8, 1299–307; 1314–28, 1371; Robertson, 1587–92, 1718–41, 1860–5, 1886–93; Davidson, 1970–2003, 2059–62; Vernon, 2092–9, 2139, 2142, 2190–3; Schlich, 2274, 2310–7, 2350–2, 2387–8, 2406–9; Drummond, 2461–6; Pitcaithley, 2644–50, 2663–7, 2673–89; Somerville, 2990–3, 3041–4, 3100, 3138–41; Webster, 3188, 3195–9, 3207, 3233, 3255–7, 3266–8; Michie, 3314–31, 3341–76; Ward, 3553–641: Parry, 3676–7, 3696–7; App. I., II. (iv., viii., x., xiii), VIII., XI., XVI.

(*c*) *Land Agents and Landowners, existing facilities,* see below (*g*).

(*d*) *Land Agents and Landowners' requirements.*—Margerison, 125–36; Bailey, 342, 349, 416–36, 467–72, 2806–7; Selborne, 514–6, 520–4; Ramsden, 608, 632–5, 646–8; Slater, 783–9, 847–56; Glanusk, 1396–400, 1475–8, 1497–8, 1557; Robertson, 1589–92, 1891–4; Vernon, 2092–8, 2142, 2190–3; Schlich, 2274, 2295, 2331, 2346–7, 2354, 2381–3, 2439–41, 2444–7, 2452; Drummond, 2461–2, 2549–59, 2610–8; Somerville, 2990, 2998–9, 3041–4, 3126–9, 3138–41; Webster, 3202; Michie, 3326–31, 3341–5, 3358–60; Ward, 3500–6; App. I. (See also (*h*) below).

(*e*) *Lectures, local.*—Bailey, 335, 387–92, 458; Forbes, 1302–7; Davidson, 1978–86, 2059–62; Vernon, 2211–3; Schlich, 2387–8; Somerville, 2990–6, 3005–8, 3049–51, 3054, 3076–8, 3099–113, 3133–6; App. II. (iv.) VIII.

(*f*) *Scholarships.*—Bailey, 367; Davidson, 1970–2, 1999–2003; Somerville, 2991, 3009, 3012–7; App. I.

(*g*) *Universities and Agricultural Colleges, existing provision.*—Bailey, 335, 342–3, 367. 461–2; Ramsden, 634–5; Drummond, 2457–8, 2468, 2550–4, 2612–8; Craigie, 2910–4, 2967–74; Somerville, 2994–7, 3008–11, 3018–22, 3056–9, 066–71; App I., II. (vi., vii.), XXII.

(*h*) *Universities and Agricultural Colleges, instruction should be given.*—Bailey, 425–36, 482, 2791, 2806–7; Selborne, 520–4, 576–8, 589; Ramsden, 632–5; Vernon, 2211–3; Schlich, 2274–8, 2282–6, 2353–5, 2439–50; Drummond, 2489, 2550–9, 2610–6; Somerville, 2992, 2998–9, 3016, 3056, 3072, 3120–8; Michie, 3343–5, 3361–4; Ward, 3494–5, 3500–6, 3510–4, 3518–20, 3529–43, 3607–9; Parry, 3676–7, 3696–7; App. I., II. (iv., vi., vii., xiii.), X., XVI., XXII.

(*i*) *Examinations.*—Bailey, 367; Davidson, 1897–9, 1948–57, 2058–9; Somerville, 2994, 3056; App. I.

(*k*) *Excursions abroad.*—Slater, 821–5; Havelock, 977–8, 1037–40; Robertson, 1662; Davidson, 1943–6; Schlich, 2274, 2290, 2452; Drummond, 2554–6; Ward, 3496, 3500–2, 3547–8; App. I.

(*l*) *Foreign countries.*—*Austria*: Bailey, 423. App. II. (v.). *France*: App. I., II. (*i.*). *Germany*: Forbes, 1143–7, 1151; Ward, 3514–7, App. II. (v.), XXIII., XXIV., XXV., XXVI. *Hungary*: Bailey, 454–7, App. II. (ii.). *India*: Bailey, 357; Schlich, 2290–2, 2355–7; App. I., II. (v., xi.). *Spain*: App. I. *United States*: Schlich, 2263; App. II. (xi.), XXIX.

ELM.—Margerison, 181; Croxford, 2731–2; App. IX., X.

ENTOMOLOGY.—Somerville, 3086–98; Ward, 3586–7.

ESTATE DUTIES, see *Death Duties.*

EXAMINATIONS, see *Education* (*i*).

EXAMPLE PLOTS.—Bailey, 335, 343–8, 382–6, 418, 507; Forbes, 1336–8; Davidson, 1986–99; Somerville, 2992–3, 3016, 3055, 3120–2; Ward, 3527–8; App. XXIII.

EXPERIMENTS, necessity of.—Bailey, 335, 347–8, 382–3, 2803; Selborne, 595; Slater, 874; Forbes, 1248–65, 1308–11; Somerville, 3047–8, 3140–1; Michie, 3467–8; App. I., XXIII.

EXPERTS (for home and colonies).—Bailey, 472–6, 2819–20, 2827; Selborne, 508–10, 525–30, 568–70; Ramsden, 606–7, 672–7; Havelock, 959–70, 1123–5; Forbes, 1281–2; Glanusk, 1549–57; Schlich, 2274, 2296, 2335–6, 2425–7; Somerville, 3038–40; Michie, 3332–3, 3382–5; Parry, 3643–6, 3729–30; App. VIII., XX., XXV., XXVIII.

EXCURSIONS abroad, see *Education* (*k*)

EXTRAORDINARY TRAFFIC, Claims by Local Authorities on account of.—Margerison, 301–4; Havelock, 1069–70; Forbes, 1352–3; Drummond, 2576, 2621–3.

FENCING.—Ramsden, 618–21; Havelock, 877–8, 897–8, 971–6, 1019–22, 1094–7; Glanusk, 1382–3, 1513–7, 1538–9, 1561–2, 1572–3, 1578; Robertson, 1625–32, 1830–3; Vernon, 2083; Drummond, 2512–3; App. I., XI.

FIR, see *Pine.*

FISHER, Prof., report on Lake Vyrnwy plantations.—Parry, 3643.

FORBES, A. C. (Analysis of his Evidence.)—Is forester to the Marquess of Bath, 1141. Has had training in Edinburgh and at Eberswalde, from which he derived much benefit, 1142–5, 1266–72. Among foresters who take an interest in their work there is a desire to get training, 1146–9, 1186–8, 1371. The best way for landowners to get foresters is to get men recommended from good estates, 1148–50. Object lessons are more important than theoretical instruction, 1151. A State demonstration area would not meet all requirements, 1152–6; it would not include much of the work usual on residential estates, 1154–60. Government should grant loans for afforestation, mature or nearly mature timber being mortgaged as security, but the land itself should not be burdened, 1161–79, 1197–210. Higher instruction should be given at a few centres, and local demonstrations at many, 1180–2. The Board of Agriculture should issue a special forestry supplement to its Journal, 1183–5. The forester generally has to take his orders from the landlord or agent, 1188–93; but these have not generally much knowledge, 1193–6. Under the present system of loans, under the Land Improvement Acts, there is no inspection once the loan is obtained, 1197–1203. Inspection should continue after the loan is made, 1204–6, 1279. Many landowners would take advantage of loans, 1207, 1280. Government should form forests by purchasing or leasing land in agricultural districts where there is not 5 per cent. of woodland, 1211–13. Absence of a regular system of working woods causes great financial loss, 1214–5; this is generally recognised by foresters, but not by owners, 1216–7. The managing foresters, but not the woodmen under them, are anxious to learn, 1218–21. The first stage of the education of foresters should take place in private woods, 1222–5. Private woods cannot be relied upon for continuity of good management, 1226–8; a Government demonstration area would be an advantage, 1228. In suggesting Government forests witness had not thought of making them educational, 1229–30. Many owners hesitate to clear and replant old woodland, 1231–2. In many cases woods remain standing after they have ceased to add profitable growth, 1233–4. There should be a standing forestry committee in the Board of Agriculture, to collect and publish information and carry out experiments as to the most profitable species to grow, 1235–47. Such experiments could only be conducted in short rotations in private forests, 1248–54; changes of management would render the results risky, 1254–7; and it would be better to carry out such investigations in forests owned by the State or by large corporations, 1254–61. Experiments can be carried on in conjunction with a demonstration forest, 1261–5. Young foresters should begin with a practical training in a forest followed by two years' technical training, 1273–8, 1314–22. Many foresters would be glad to call in the advice of an expert, 1281–2; and the existence of such experts would be a great advantage, 1283–8. The condition of forests in this country is bad, 1289. It should be possible to interest landowners in improving their woods by showing what could be done in a demonstration forest, 1290–8. Sporting is a necessary evil, 1293; the woods could be improved without limiting the sport, 1294; rabbits are excluded from this statement, 1295–7. If there were a school in connection with the demonstration area, young men could begin by being apprenticed there, 1299–1301; meanwhile it would be an advantage to have local lectures, 1302–5. Many men in witness's neighbourhood would go to such lectures, 1306–7. Landowners might form associations to start experimental stations, 1308–10. The experiments should be arranged according to the facilities for carrying them out, 1311. Oaks do no good on clay land in his district, 1311–13. Young foresters should be trained on an estate under a thoroughly competent forester, 1323–8. Forestry pays well at Longleat, 1329. Larch in his district gives the best return at 40 years, and fetches 1s. a foot, 1330–4; Douglas fir also does well, 1335. County Councils might give demonstrations, 1336–40. A State forest is the best system, and witness suggests an alternative failing a State forest, 1341–4. The New Forset is practically waste, 1345–7, 1361–5. The existing State forests are of no value for educational purposes, 1348. Salaries of foresters are not sufficient to render any expenditure on training remunerative 1349–51. Traction engines are necessary, but owners are constantly having claims made against them for extraordinary traffic, 1352–3. Death duties are a great drag on forestry, because the expenses on woods are reduced in order to pay the duties, which disorganise the working, 1354–7. A demonstration area should be chosen to show the best results, 1358–60. There is much waste or poor land which could be profitably put under timber, 1366–9. There has been improvement in the methods of thinning woods, 1370. It was not generally realised ten years ago that treatment which would suit one kind of timber would not suit another, 1372–7. The cultivation of larch has had a deteriorating influence upon sylviculture, 1378–80.

Appendix VIII.—Suggestions for the improvement of British forestry: (1) Appointment of a standing committee on forestry by the Board of Agriculture, with a staff of consulting experts; (2) advance of loans to landowners by Government; (3) formation of State-controlled forests in rural districts containing too small a proportion of woodland; (4) practical demonstrations in the woods, and short course of lectures on sylviculture to working foresters and woodmen in convenient centres.

FOREST SCHOOL, see *Demonstration Forest* (*d*).

FORESTERS and WOODMEN, knowledge and need of education.—Margerison, 26–35, 125–32; Bailey, 336–8; Selborne, 533–4, 581–6; Ramsden, 646–8; Slater, 755–62, 768–72, 870–1; Havelock, 1014–8; Forbes, 1146–9, 1218–21; Glanusk, 1390 1400; Robertson, 1605–11, 1715–7; Vernon, 2093–8, 2190–3; Drummond, 2464–6; Pitcaithley, 2688–90, 2714–21; Webster, 3206, 3266–8; Michie, 3314–5, 3325, 3361–6.

See also *Education* (*a*), (*b*).

FORSTGARTEN, see *Example Plots*.

FOX COVERTS.—Craigie, 2945–53.

FRANCE: (*a*) *Education in.*—Bailey, 342. App. I., II. (i.).

(*b*) *Forestry.*—App. II. (i., xi., xiii.), XXVII.

(*c*) *Imports of pitwood from.*—Drummond, 2472–3, 2518, 2565–6; Croxford, 2762.

(*d*) *Legislation regarding forests.*—App. XXV., XXVI.

FUNGI.—Somerville, 3086–98; Ward, 3586–7.

See also *Larch disease*.

GALES.—Bailey, 373; Schlich, 2333–6; App. I.

GAMBLE, J. S. The Forestry Exhibition at Paris and some of its lessons.—Exhibits by French Government; afforestation of sand dunes and mountain slopes; Russian forests; economy of refuse material; importance of education; wood-pulp industry; steps taken in United States and Canada to preserve forests; State forests; forest societies: App. II. (xiii.).

GAME (see also *Rabbits*).—Bailey, 335; Selborne, 518, 549–53; Ramsden, 695–8, 737–8; Havelock, 877–8, 884–6, 978–9, 1023–6, 1101–4; Forbes, 1293–4; Robertson, 1633; Drummond, 2577; Pitcaithley, 2708; Webster, 3191*, 3208; Michie, 3336–9, 3478–91; App. I., II. (ix.), III., VII., XI., XIX.

GERMANY: (*a*) *Education.*—App. II. (v.), XXIII., XXIV., XXV.

(*b*) *Legislation regarding forests.*—App. XXVI.

(*c*) *State forests*, area and finances.—App. XXVII.

(*d*) *Timber supplies.*—Schlich, 2259; App. II. (xi.).

GIESSEN University.—Regulations concerning instruction in forestry; scheme of lectures, 1901–3; description of the University example plots (*Forstgarten*); App. XXIII.

GLANUSK, LORD. (Analysis of his Evidence.)—Is a landowner in Breconshire, 1381–2. Larch is very profitable under favourable conditions, 1382. It should be planted in not less than four acre plots, otherwise the cost of fencing is too heavy, 1382–3, 1516–7. Clearing in Breconshire costs about 10s. per acre, 1383. A plantation of 4 acres costs £39 to fence, 1383, 1421–6, 1513–7, 1531–44, 1560. In his 4 acre plantation, witness made £46 after ten years, after 20 years he gets from another thinning, for pit props, £57 10s.; and sold the whole 4 acres at the end of 45 years for £400, 1383. This gives a return of 3 per cent., and an annual rent of 18s. per acre, 1383, 1518, 1574–5. The rent of this land would be 15s. to 18s. per acre, 1441, 1485. Land after larch is only fit for a second crop of larch, which would probably not yield so large a profit, 1383, 1454–57. Rabbits are very costly to exclude, 1383. It would not be profitable for Government to plant the Welsh hills, 1383. Witness's grandfather planted 50 acres at a cost of £400, with a resultant loss of £1,130, 1383. Profitable planting could probably be done up to about 1,000 feet, 1384–6, 1464–74. Larger plantations, though saving in fencing, would not enable one to go to higher altitudes, the lower trees would not shelter the others, 1388–9, 1471–4. Planting is well done in Wales, 1390, 1479–84. Landowners and land agents have not the technical knowledge, but the land agent knows more about prices than the forester, 1391–5. Timber is sold sometimes by auction and sometimes by tender, 1395. There would not be much advantage in a State demonstration forest and higher education, 1396–1400, 1475–8. Landowners can get a sufficient knowledge by going into an agent's office, 1399. The training that foresters get now is sufficient, 1400. Forty-five years is about the paying rotation in Wales, 1401. Squirrels and rabbits do most harm in Wales, 1402–3. Rates are rather high, but not a bar to plantations, 1404. The tithe is much less than 2s. per acre, 1404–8. Sheep walk rights on the hills would interfere with planting, 1408; it is the custom in Wales for tenants of land lower down to have a right of running sheep on the mountains, 1408–10. Larch disease exists in the neighbourhood, but witness has not himself had much loss from it, 1411–4. There seems to be more disease on the Silurian than on the old red sandstone, 1435. Douglas fir grows quickly, but is not so profitable as larch, 1415–6. It is customary in Wales to let land lie for two years after felling, to "let it see the sun," 1401, 1417–21. Planting costs about £10 per acre, 1421–3. One man plants about 400 trees per day, 1424–6. Has no experience of injurious insects being introduced in imported timber, 1427. Witness plants larch pure after larch; this is better than mixing it with other trees, 1428–34, 1457–63. Labourers in woods get about the same wages as ordinary agricultural labourers, 1436–40. The hill land yields no rent; it is common land, used for sheep walks and sporting purposes, 1441–4, 1486–9. Much pitwood is imported into South Wales, 1393, 1445–53. Witness' larch thinnings at 20 years old are sold for pitwood, 1451–2. Witness plants trees, purchased as seedlings, and grown in his own nurseries up to four years of age, 1383, 1394, 1480–3. Witness has only grown larch for profit, 1387, 1490–5. Witness's opinion as to present methods of education being sufficient is only based on his experience with larch, 1497–8, 1557. The plantations which failed are high up, exposed, and there were difficulties of transport, which probably diminished the price obtained for the timber, 1499–1508, 1545–8. It does not pay in Breconshire to plant land worth more than 5s. to 8s. per acre otherwise, 1508, 1576–80. Prices have fallen very much, 1393, 1449, 1509–12, 1535–7. The grazing rights attached to the farms would interfere with planting the hill lands; it would be very difficult and unpopular to expropriate these rights, 1519–27, 1558–9, 1565–71. If the Birmingham Corporation has bought these rights on the gathering ground of their water supply, hill-planting might be tried there as an experiment, 1528–30. To protect against rabbits adds £2 per acre to the fencing, 1402, 1538–9. The prospects of timber growing in South Wales are good, 1538–40. The area under woods in the county is being slightly extended, 1541–2. Interest was always taken in forestry in the county, 1543–4. Witness has not called in expert advice, and does not know where to get it, 1549–57. Plantations have to be fenced against sheep, 1561–2, 1572–3. The hills are not overstocked withsheep 1563–4. Snow drifts enable rabbits to nibble the tops of trees 14 feet high, 1578.

GORSE planting.—Craigie, 2945–7.

GRAZING: (*a*) *Rights of tenants over moorland, etc.*—Glanusk, 1408–10, 1441–4, 1486–9, 1519–30, 1558–71; Drummond, 2478, 2503–5, 2531–9, 2592–609, 2619–20; Pitcaithley, 2670–1; Webster, 3214–6, 3227–9; Parry, 3650–6, 3679–87.

(*b*) *Value of land*, see *Sheep farming*.

GROUSE.—Davidson, 2014–6; Michie, 3336–9, 3477–9; App. I.

HARES.—Selborne, 549; Ramsden, 695–8; App. I., VII., XI.

HAVELOCK, W. B. (Analysis of his Evidence.)—Forester to the Earl of Yarborough in Lincolnshire, and formerly to Lord Feversham in Yorkshire, 875, 921–3. Has made forestry pay, 876. Is not troubled with game in Lincolnshire, as no expense has been spared for wire netting, 877–8. There are saw mills and creosoting works on the estate, 879–80. The estates produce timber of the highest quality, 881–2. The net profits on the woodlands are probably better than on the agricultural land, when outgoings are considered, 883. In Yorkshire the estates were not entirely clear of game, but rabbits were kept down, 884–6. Rabbits are the chief obstacle to the growth of timber, 887–9. A model forest is wanted, where all the operations of sylviculture can be demonstrated; a great deal can be learnt by seeing a thing, 890–7, 913, 1037–41. It is difficult to get proper book-keeping in forestry, estate offices put the expenses of other things down to the woods, 897, 1098–1100. Fencing ought not to be all charged to the woods, 897–8, 1096–7. The whole expense of well-kept roads is also charged to the woods, although all that is required is a rough road sufficient to get the timber out, 899. Woods on gathering grounds of water supplies increase the quantity of water, 900–1. Woods are rated above the value of the land, 902–4, 936–42, 994–999. They ought to be rated only on the agricultural value of the land, or only rated when yielding income, 1000–6, 1105. The woods under his charge are well laid out for getting the timber out, 905–7. Traction haulage is economical, 908–10. Railway charges are excessive, 911, 915; they were one of the reasons which led to Lord Yarborough's setting up a creosoting plant for the timber used on the estate, 911–3. Creosoting effects considerable economies, 912–14. Many young foresters are keen to be educated; at present, they are trained under older foresters, 916–7, 964–6. All classes need education, 918. Landowners are interested, but generally lack knowledge, 919–20, 986. Careful accounts are kept at Brocklesby, and shew the woods to be profitable, 924–8. There is practically no copse-wood, the other kind pays better, 929–30. There is sufficient local demand for what copse-wood they have, 931–2. A visit to Castle Howard taught him to plant more thickly, 893–4, 933–5. There should be a good central road in a large plantation, but otherwise roads should only be made when needed to get the timber out, and the ruts filled up afterwards, 899, 943–5. The distance from the station is a more important factor in the price obtained for the timber than the state of the roads, 946–7. The timber on the estate is sold publicly, by preference, either by tender standing, or by private tender felled, or public auction, 948, 1042–46. Prices have improved of late years, 949–50. There is not much larch disease in Lincolnshire, 951. Witness is in favour of providing technical education for head foresters and their sons, but most of the men under him in Lincolnshire do not show much desire for it, 952–7. There are not many openings for trained men, 959–63. Landowners and younger foresters would probably take advantage of expert advice if it were available, 967–70. Fencing against rabbits is a delusion, 971–6, 1019–22; keepers have been known to make holes in the netting, 973, 1020–22. Rabbits have become more artful, and it takes a higher netting to keep them out than formerly, 972–6. German methods could be adopted in this country with advantage; but the game question in

many cases precludes it, as foresters are often obliged to thin so as to secure bottom cover for game, 978–9. With instruction, forestry could be made much more profitable, 979–80. Large areas might be planted, 981; the State might profitably plant such lands, 982–8. Witness does not believe in State loans for planting, as, owing to the necessary supervision State and landowner might come into conflict, 982–4. The woods at Brocklesby are between 5,000 and 6,000 acres, and have been regularly managed for over 100 years; the expenses are not half the receipts, 989–94. The sessile oak would probably thrive better on some high ground Brocklesby than the pedunculated oak, 1007–13. Even on a well-managed estate like Brocklesby mistakes have been made, 1006, 1014, which might be avoided by means of education, 1015–18. If owners had a clear idea of the damage done by game it would have a beneficial effect, 1023–6. Forests are often unprofitable because owners take out the best young trees to supply orders, 1027–30; or leave them after they have ceased to grow profitably, 1031: working plans would remedy this, 1032–3, 1117–8. On large estates there is plenty of room for growing profitable crops of timber without interfering with the artistic beauty of parts near the house or along the drives, 1034–7. Hedgerow timber rather beautifies the estate than is a profitable crop, 1047–8. The 1s. per foot obtained for ash (see App. VI.) was a low price because the timber was small and rough, 1049–50. The labourers in the woods get more than ordinary agricultural labourers, 1051–2. There is no scarcity of labour, 1053–4. There is a good demand for the timber at Brocklesby, 1055–63, one reason being that the sales there have been a regular thing for many years, 1063. The timber trade is rather slack at the present moment, 1059–61. The woods are 2 to 6 miles from the railway station, 1064–5. The timber is hauled by traction engine on the public roads, but all on the property, 1066–8; local authorities do not impose any restrictions, but sometimes owners are handicapped by bridges being scheduled, 1069–70. Timber merchants do not seem to use traction engines much, 1071–5. There is a demand for education in forestry, 1076–9. Young foresters should be trained for a year or two in an experimental area, where they would receive wages for work performed, 1080–5. A demonstration area is wanted to show how things should be done, 1086–91. Larch pays earlier than ash, but in some woods larch has been mixed with ash, the larch being afterwards taken out, leaving a fine crop of ash, 1092. Ash thinnings at 30 years of age are easily-marketable, 1093. It is possible to use wire netting against rabbits twice over, 1094–5. Shooting rents are not credited to the woods, 1101–4. The creation of shelter belts improves the land, 1106–9; and such shelter belts should not be rated because the rates fall upon the improved agricultural value, 1109–12. There is a tendency to convert coppice into high forest now, 1113–6. Witness has seen natural regeneration of beech in Lincolnshire, 1119–21. Trained foresters would be able to give advice to owners, 1123–5. Foresters as a rule are insufficiently remunerated, 1126. Witness has grown oaks by sowing acorns, 1121, 1128–40; though game and rabbits interfere with them, 1133, 1138–40.

Appendix VI.—Particulars of receipts and expenditure of the final clearance of an 18 acre plantation, 75 to 80 years' growth, in North Riding of Yorkshire, felled off in 1890–91.

Appendix VII.—Note on rabbits, game, thinning of woods, present supply of foresters, and creosoting.

HAWKS.—Selborne, 517, 549–50.

HEDGEROW timber.—Margerison, 171–6, 239–43; Havelock, 1047–8; Vernon, 2242; App. I.

HERIOT-WATT COLLEGE.—Bailey, 433; App. II. (iv).

HESSE: (*a*) *Forestry Education.*—App. XXIII.

(*b*) *Legislation regarding forestry.*—App. XXV., XXVI.

HIGHLAND AND AGRICULTURAL SOCIETY: (*a*) *Evidence on behalf of.*—Michie, 3313–3491.

(*b*) Examinations; Davidson, 1948–57, App. I.

HOPTON, C. (Analysis of his Evidence).—Is Vice-President of the Timber Trades Federation, 311. On French and Belgian railways a rebate is given on all timber for export, 312–17. Witness has received beech from Belgium, 318–21. Beech butts are used for wrest-planks in pianos, 322 (and 102–4); but the piano-cases are made of all kinds of wood, 323–4. Witness purchases ash for bending, and finds that only English ash will bend, 325–7. The supply of English timber diminishes year by year, and owing to railway rates merchants are obliged to use foreign in place of British timber, 328. American ash is not suitable for bending, 329. Very little young ash is coming along in this country, 330. Railway rates are 30 to 60 per cent. higher for British than foreign timber, 331.

HORTICULTURAL SOCIETY, ROYAL, Evidence on behalf of.—Webster, 3187–3312.

HOWARD, E. Stafford.—Area under wood of Crown Forests in the United Kingdom, App. XXI

HUNGARY: (*a*) *Education.*—Bailey, 454–7, App. II. (ii.).

(*b.*) *Legislation concerning forestry.*—App. XXV, XXVI.

(*c*) *Timber supplies.*—Schlich, 2259, App. II. (xi.).

IMPORTS.—Margerison, 124, 137–44; Hopton, 318–21; Vernon, 2116, 2206–10; Schlich, 2258–62, Drummond, 2472–3, 2498, 2518, 2526–9, 2565–6; Croxford, 2729–81; Roberts, 3734–5, 3743–66, 3777–8; App. II. (x., xi.), III., X., XVIII.

Probable diminution of, see *Timber* (*d*).

IMPROVEMENT OF LAND ACTS.—Craigie, 2898–9, 2936, 2940; App. XIII.

INDIA: (*a*) *Education of students for service in.*—Bailey, 357; Schlich, 2290–2; App. I., II. (v.), XX.

(*b*) *Forestry in.*—Bailey, 459–60, 2825–6; Schlich, 2290, 2355–7.

INDUSTRIES, LOCAL.—Robertson, 1669–72; Vernon, 2113–22, 2153–8, 2206–9, 2227–31; Michie, 3471–2; Parry, 3643, 3664, 3674, 3691–5; App. I.

INLAND REVENUE DEPARTMENT, Evidence on behalf of.—Minchin, 3142–86; App. XV.

INSECTS, damage by.—Bailey, 379; Glanusk, 1427; Schlich, 2379; Somerville, 3086–98, 3132; Ward, 3586–7.

IRELAND.—Schlich, 2330–6; Webster, 3286–3312.

ITALY, legislation concerning forestry.—App. XXVI.

JAPAN, timber supplies.—App. II. (xi.).

KEW, training of gardeners.—App. XX.

KNOCKBOY, failure of plantations at.—Schlich, 2333–6.

LABOUR, demand for, in woods.—Bailey, 335, 404; Selborne, 535–7; Slater, 833–7; Havelock, 1051–4; Glanusk, 1436–40; Robertson, 1612–4, 1667–72, 1816–25, 1878–84, 1895; Davidson, 1915, 2004–27; Vernon, 2215, 2220, 2245–8; Schlich, 2395; Drummond, 2508–11, 2591; Pitcaithley, 2651–4; Michie, 3426–37; Parry, 3692–3.

LAND AGENTS and LANDOWNERS, knowledge and need of instruction.—Margerison, 36; Bailey, 349: Selborne, 576–9: Slater, 767, 783–9, 828–31; 847–51; Havelock, 918–20, 986; Forbes, 1193–6, Glanusk, 1391–5; Robertson, 1891–4; Vernon, 2092–9, 2142, 2190–3; Schlich, 2274, 2355, 2440, 2448–50; Drummond, 2457–63, 2549–59, 2610–8; Somerville, 2990, 3025–37; Webster, 3200–2; Michie, 3326–31, 3341–5, 3358–60; App. I., X.

See also *Education* (*d*).

LAND IMPROVEMENT COMPANIES.—Forbes, 1197–1203; Davidson, 2028–30; Drummond, 2579–83; Craigie, 2887–903, 2915–42; App. X., XIII.

LARCH: (*a*) *Generally.*—Margerison, 195–6; Bailey, 393–5; Ramsden, 658–62; Slater, 790–803; Havelock, 1092; Forbes, 1330–4, 1378–80; Glanusk, 1382–3, 1428–34, 1451–63, 1490–5; Robertson, 1802–6; Vernon, 2082–6, 2237–41; Schlich, 2428–32; Drummond, 2493–9, 2523–4, 2563; Croxford, 2745; Michie, 3402–18, 3448–64; Roberts, 3740–1, 3767–75; App. I., V., X., XI., XVIII.

(*b*) *Disease.*—Margerison, 83; Selborne, 542–6, 595–7; Havelock, 951; Glanusk, 1411–4, 1435; Robertson, 1798–1804; Schlich, 2436–8; Drummond, 2493; Somerville, 3086–9; Michie, 3404–17, 3454–64; App. I.

(*c*) *Japanese.*—Selborne, 595–8; Michie, 3412–8, 3448–64.

(*d*) *Prices.*—Slater, 838–40; Forbes, 1330–4; Webster, 3272–3; Parry, 3643, 3661–2; App. VI., IX., X.

LECTURES, see under *Education.*

LEGISLATION, foreign, regarding forests.—App. XXV., XXVI.

LIME-TREES, utilisation of, in Russia.—App. II. (xiii.).

LIVERPOOL waterworks catchment area.—Drummond, 2536–8; Parry, 3643–732; App. XVII.

LOANS.—Margerison, 308–10; Havelock, 982–4; Forbes, 1161–79, 1197–1210, 1279; Davidson, 1930–2, 2028–31; Vernon, 2088–9; Schlich, 2295; Drummond, 2579–83; Pitcaithley, 2725–6; Craigie, 2887–900, 2915–40; App. I., II. (ix, x.), III., VIII., IX., XIII., XXV.

LOCAL AUTHORITIES, see *Bridges, Extraordinary Traffic,* and *Rates.*

LOCAL GOVERNMENT BOARD, ENGLAND, memorandum by, on rating of woodlands.—App. XIX.

———————— SCOTLAND, Evidence on behalf of.—Maxwell, 2831–86; App. XII.

LOCAL TAXATION (CUSTOMS AND EXCISE) ACT.—Craigie, 2912–3.

MARGERISON, S. (Analysis of his Evidence).—Is an English timber merchant, represents the Timber Trades Federation of the United Kingdom, 1–2. Foreign methods of forestry produce better financial results than English on the whole, though for certain limited requirements the quality of British timber is more suitable, especially where resistance to indentation and durability are required, 3–9, 69–71, 93–108, 185–8. For some purposes foreign timber commands a higher price than British, 10–11. Timber could be grown of as good quality at home as abroad, 12. Coniferous timber should be grown dense, 13–14. Working plans would be an advantage to grower and merchant, 15–17. Regularity in supply and getting the timber into handier shape for transport might result in cheaper railway rates, 18. Canals are not cheaper than railways, 19. Steam haulage on roads is cheaper, 20. Round timber is charged by railway companies at a higher rate than squared, 21, 154–61. Roads are not usually well laid out in the woods for carting away the timber, 22–4. The plant in British sawmills, at least in towns, is probably up to foreign standards, 25. Most foresters and wood managers are qualified to value standing timber, 26–35. Owners and agents seem to know more about the selling value than the management of their woods, 36. Foresters should be trained by attending classes at various centres, 37. Has not come across serious accidents from neglect to provide shelter belts or from improper safeguards on locomotives, 38. We could produce the greater part of the timber we require on land which would yield less under farm crops, 39–43. British oak is better than any other oak, 40. The cost of transport is sometimes equal to the value of the timber, 44, 111–13. Forestry, is doubtful, financially, if the land is worth 7s. 6d. to 10s. per acre for other purposes, but very much depends upon the means of transport to the market, 44 The question of good or bad roads in the woods affects the price a merchant offers for the timber, 45–8. There is increasing difficulty in getting good British oak and ash, 49–52; and the supply is likely to become more restricted in the near future, 53–5. Witness draws his supplies principally from Yorkshire, 56. Some owners replant after felling, and there is a tendency to plant closer, 57–9. There is an increasing interest in forestry among landowners, 60–2. Woods are generally too heavily thinned in this country, 63–4 English foresters are becoming converted to continental methods, 65–8 English beech, grown thin, is denser and heavier than foreign, and so more suitable for certain purposes, 69–71, 93–105. Irish timber is much the same as English, 72–3. The price obtained for small lots of timber is lower because large lots can be transported more cheaply, 74–5, 122. Corporations might plant the gathering grounds of their reservoirs, 76–80. At the present time, oak or ash would probably be the most profitable trees to plant, 81, 164–5, 170. It is not profitable to grow pit wood in Yorkshire, 82. Disease makes larch a risky crop at present, 83. Older foresters are generally prejudiced against education, 84–6. Colliery spoil heaps are planted in few cases, but in many cases the atmosphere is too polluted for trees to grow well on them, 87–8. Afforestation would help to keep the rural population in the country, and gives employment to labourers chiefly at slack times, 89–92. Generally, home timber from hardwoods is for certain purposes better than foreign, 93–5. The value of British beech is roughly 15 per cent. more than German, 96–104; so that the German method would give better financial results if 25 per cent. more timber were grown, 105–6. British beech is used in pianoforte making, 102. Imported coniferous timber is superior to British, 107–8. More coniferous timber is required than hardwoods, 109–10. The cost of transport could be materially reduced by converting round timber into square before removal, 111–21. Foreign supplies of timber will probably fall off in the future, 124. Education is more important for the owner and manager than the woodman, 125–29; the education of the latter, which is also important, will follow, 130–2. The remuneration of foresters should be higher than at present, 133. The education of owners might be more concentrated than that for foresters, 134–6. Foreign timber is more suitable for pit-wood, and is carried at more favourable rates, 137–44. Witness has paid as much as 5d. per cubic foot for cartage of timber, 145–50. With the large areas abroad, the cost of cartage is reduced by slides, tramways, etc., for removing timber, 151–53. Witness's trade is practically all in home-grown timber, 162–3. Ash and oak are the most important to grow so far as regards value per acre, but the demand in volume is greater for conifers, 164–5. The price of ash has not fallen, 166; but Scots pine has fallen about half in the West Riding, 167. In Scotland, or where there are shipping facilities to colliery districts, it might be better to grow pit-props, 168–9. Hedgerow timber is valuable for certain purposes, and can generally be easily transported, 171–6. English oak-timber is a good material for paving blocks, 177–80. Beech and conifers might also be used for wood pavement, 181–84. English oak is preferred to foreign for railway waggons, 185–8. The Timber Trades Federation have not succeeded in getting concessions from railway companies, 189–94. Larch should not be planted close together, 195–6. Some railway companies use foreign oak, because it is cheaper, but English is more durable, 197–202. There has been a fall in the price of oak timber in the past year, but there will always be a good demand for it, 203–9. In converting round timber to square some 33 per cent. is thrown away as slabs and sawdust, 210–21. Round timber does not necessarily contain more water than deals, and this does not entirely account for the difference in rates made by railways for the carriage of round and square timber, 222–5. It is generally more convenient to have the higher grade sawing machinery in the towns than to have saw-mills on the estate, 226. With cheap timbers it might pay as well to use the slabs

for firing the boiler, 227–29. Witness has not had much experience of steam haulage of timber on roads, 230–3 ; but its use is hampered by local authorities frequently scheduling bridges, 234–8. For certain purposes English hardwoods are preferable to those grown in closer forests, but witness would not make the production of such denser timber the object of sylviculture, as enough could probably be got from hedgerows and the exposed fringes of woods, 239–43. The awkward shape of much English round timber may account for the higher charge of railways, but witness has obtained no reduction by offering to prepare the timber, 244. On shorter runs the terminal charges are relatively higher, but disproportionately so, 245–6. Ash varies much in quality, 247–50. Shake seems to prevail in some districts and soils more than others, 251–3. Frost may be one cause of shake, 254–5. Oak grows well in association with beech, 256–60. Has not noticed if it is less liable to shake under such conditions, 261. Witness does not know of any case in Britain where the purchaser of timber was obliged to replant, 262. Rabbits cause much injury, even to quite old trees, and the injury is often permanent, 263–7. Large areas in Wales might profitably be planted, 268–70. Ash fetches, on the whole, at least as good a price as oak, 271–6. Oak matures at a much greater age than ash, and as the yield per acre would be about the same, the ash is the more profitable, 277–91. Has seen a band of shaken trees running through a wood, on ground slightly raised or slightly hollow, 292–3. Ash of over thirty years may be barked by rabbits, 294–5. Birds ought to be protected by the forester, 296–9 ; also weasels, stoats, and moles, 300–1. Owners ought to use their rough common timber on the estate, and send only the best to market, 301. Local authorities hamper the timber trade by making claims for extra ordinary traffic, 301–303. Timber merchants try to meet this objection by using broader wheels, 303–4. Plantations pay rates for a long period, while they get no advantage from them, 301. Advantage might be derived from a travelling saw-mill, 305–8. Government might assist the development of waste lands by granting loans under State supervision, 308–10.

Appendix III. (Principally on the relative merits of British and foreign timber.)

Appendix IV. Extract, relating to timber, from the General Railway Classification of Goods, 1902.

MAXWELL, J. T. (Analysis of his Evidence).—Is nominated by the Scottish Local Government Board, 2831. There is no official definition of woodlands in Scotland, 2832–5. Woodlands which are grazed and shot over are rated at both their grazing and shooting values, 2836. The grazing value of the wood is rated, the matured timber itself pays nothing, 2837–42. Young wood which cannot be grazed, and therefore is worth nothing, is rated at its full grazing value, 2839. Is not aware of any complaints in Scotland as to rating, 2843, 2851. The Report of the Royal Commission on Local Taxation does not suggest any change as regards woodlands, 2844–7. Railways in Scotland are assessed specially by an official, the deductions in their case are often large, 2848 ; such deductions involve heavier rates on other subjects, 2849. Woodlands are excluded from "agricultural land" for rating purposes, 2850–1. If there is any deficiency in the amount raised for parish rates, owing to the deductions allowed on agricultural land, the rate has to be raised, 2852–60. In a few parishes, woodlands are treated as favourably as agricultural land, so far as regards parish rates, 2860–2. The guiding principle in assessing land to rates in Scotland is that land planted will make the same return as under grazing, 2863–7. The value of the ground before it was planted is taken as the basis of assessment, 2867–72. Timber does not entirely escape assessment, because it has been paying rates during the time when the trees were young, and the land could not be grazed, 2873–7. The Inland Revenue Officers are in most counties the assessors, and the practice of assessors does not differ widely, 2878–84. The values appear to be on the whole properly fixed, 2883–6 ; there are two appeal courts, 2885–6.

Appendix XII.—Rating of woodlands in Scotland.

MELARD, M., Insufficiency of the world's timber supply.—App. II. (xii.).

MICE, damage by.—Selborne. 517 ; Havelock, 1133.

MICHIE, J. (Analysis of his Evidence).—Commissioner to the King at Balmoral, represents the Highland and Agricultural Society of Scotland, 3313. There is great need for forestry education, especially practical, 3314–5. A timber famine is imminent, 3315. An experimental area of not less than 10,000 acres should be obtained in the central part of Scotland, and a school for scientific teaching established on it, 3315, 3328–9, 3334–9, 3380–1. Witness has practical experience of forestry in Scotland, 3316–20 ; and has control of 6,000 acres of woods at Balmoral 3317–9. Has himself felt the need of training, 3321. There is an absence of proper management, 3315, 3322–4. There is a general desire among foresters for training, 3325. All classes (owner, factor, and forester) want education, but specially the forester, 3326–31. One expert might control the woods of several estates, 3332–3. An area of moorland, if bought for a State forest, would yield some income, from grouse or agriculture, before it was in full working order, 3336–9. Perthshire would be a good centre for a State forest, 3340, 3386–7. Instruction to all three classes should be given at the school, 3341–5, 3360. Scientific instruction could not be so well given at a university, 3343–5, 3361–4. All conditions cannot probably be had at one centre ; there should, therefore, be one principal centre for teaching, and other areas might be visited, 3346–7. Foresters should know something of the sciences underlying forestry, 3329 3348–51. The teaching a boy has got in a secondary school would give a sufficient knowledge of these sciences, 3329, 3351 ; and he should go from there direct into the forest, 3352–3. We shall probably have a timber famine in about thirty years, 3315, 3354–7. Canadian yellow pine, which used to be 1s. a foot, is now worth 5s. a foot, 3356. Factors and owners should be educated sufficiently to understand what the forester proposes, 3327, 3358–9. The maintenance of a school in the forest to give a scientific training would be expensive, 3342, 3361–4. Men who have been through courses of forestry in Scotland have not a practical knowledge, 3361, 3365–6. If a field of practical instruction could be provided, these courses would turn out better men, 3366–76. If owners were sufficiently educated to realise the value of their words, the remuneration of foresters might improve, 3331, 3377–9. With the means of education a class of well-paid consulting foresters might be found, 3382–5. Land in Perthshire would be expensive, 3388–93. The management at Balmoral has for some time been good, 3394–5. Sheep and deer prevent natural regeneration, 3394. Land could be profitably planted if worth only 10s. per acre, and it might sometimes pay if it were worth £1 per acre, 3396–9. Trees grow profitably on the Grampians up to 1,500 feet, 3400–1 ; on such land Scots pine is better than larch at high altitudes, 3402–3. Tyrolese larch is better than that from Scotch seed, and resists disease better, 3404–11, 3454–6. Has not seen disease in Japanese larch, but the latter has not yet had a sufficiently long trial to show whether it is disease proof or not, 3412–7, 3448, 3458–64. Japanese larch grows more slowly than native or Tyrolese larch, 3417–8, 3448–51. Native Scots fir is better than the continental, 3419–20. Sheep farming is not remunerative at present, 3421–5. Sheep farms are rented in the Highlands at from 2s. to 5s. per head, 3425. Suitable sheep land there carries a sheep on one or two acres, but they have to be sent away to winter, 3426–8. Forests employ one man to 100 acres, 3429–31 ; while 1,000 acres find employment for only one shepherd, 3432–5 ; so that apart from the labour of removing the trees felled, and subsequent industries, such sheep land would support ten times the population if placed under forest, 3436–7. Scots pine grown in the Highlands is as good as Baltic, 3438–9, 3452. The home-grown timber lasts very well ; witness knows of timber 300 years old, 3440–1, 3445–7. Where the pine is bad it is due to bad management, 3442–4. The Scots pine may not produce a good timber if grown in unsuitable places, 3443–4, 3452–4. Larch plantations ought to be perpetually replenished by Tyrolese seed, 3455–6. Nursery grounds are sometimes badly chosen, 3465–6. There should be a

State area where experiments are conducted, 3467–8. Natural regeneration is not sufficiently practised in Scotland, 3469–70. With a full crop in the forests, the industries connected with its manufacture would employ a larger population than the actual growth would, 3471–2. The extension of forestry would be the most effective means of solving any land question in the Highlands, 3473–4. There is a very large area in the Highlands which could be profitably afforested, 3475–7. The returns from forestry would compare favourably with the sporting rentals, though they would be deferred, and there would be an immediate loss, 3478–9. Private owners will not afforest, hence we must look to State forests, 3480–81. Afforestation would interfere with deer-stalking, 3482–91; though the loss of the shooting rents might be to a certain extent mitigated by planting gradually, 3488–90.

MINCHIN, C. O. (Analysis of his Evidence).—Represents the Inland Revenue Department. The value of agricultural property, for the purpose of estate duty, may not exceed 25 times the annual value, 3143. At first the Inland Revenue Department included the value of all timber on any woodland in such agricultural property, in addition to the pastoral value of the land, 3144–7. Under the system now in force, if the estate is valued at 25 years' purchase, the timber is not brought into the account, 3148–50, 3152–6; but if the estate is valued at less than 25 years' purchase, the value of the timber, or such a portion of it as will bring the total value up to 25 years' purchase is added, provided that the total value thus obtained is never greater than 25 times the annual value of the land, 3151–5, 3176, 3181–3. Woodlands are assessed to rates in different ways, according as the land is used for plantations and woods or for growing saleable underwood, 3156–9. Timber in a rich district, where land is worth 25 years purchase, thus escapes estate duty, whereas on poor land worth less than 25 years' purchase, it pays duty, 3160–70. So that the maximum limit of 25 years' purchase becomes, provided there is sufficient wood on the estate, a minimum, 3171–5, 3183. The hope of increased income may be taken into account in valuing for estate duty, 3172–3. The system of taxing the timber (when the land is valued at less than 25 years' purchase) acts as a premium on cutting the timber to pay the death duty, 3176–80. In bad counties land may be valued down to 19 or 20 years' purchase, 3184–6.

Appendix XV.—Memorandum on the official practice as regards the assessment of death duties in respect of timber and woodlands; with an extract from a succession account of timber felled and sold, and extracts from two estate duty accounts.

MOLES.—Margerison, 300–1.

MORTGAGE of standing timber.—Forbes, 1161–79, 1208–10; Pitcaithley, 2725–6; Craigie, 2892–6; App. VIII.

NANCY, school at.—Bailey, 342, 2804; App. I., II. (i.)

NEW FOREST.—Forbes, 1345–7, 1361–5; Schlich, 2293, 2321–2; Drummond, 2468; App, I., VIII., XXI.

NISBET, J.: (*a*) Expert advice to Lord Selborne.—Selborne, 508–10, 525–30, 554–8, 581–6.

(*b*) British Forestry and its future prospects.—App. II. (x.).

NORTHUMBERLAND COUNTY COUNCIL.—Davidson, 1978–80, 1999–2003, 2059–60; Somerville, 2990–3, 3005–6, 3017, 3049–55.

NORWAY.—Schlich, 2259; Roberts, 3735–7, 3743–6; App. II. (xi.), XVIII.

OAK: (*a*) *Cultivation of.*—Margerison, 49–55, 164–70, 271–92; Havelock, 1007–18, 1121, 1128–40; Forbes, 1311–3; Vernon, 2162; App. I.

(*b*) *Prices.*—Margerison, 203–9; App. VI., IX., X.

(*c*) *Quality.*—Margerison, 40, 177–80, 185–8, 197–202; Croxford, 2731; Roberts, 3734, 3751–6; App. III., XVIII.

ORDNANCE SURVEY.—Craigie, 2907–8, 2929, 2954–66.

OXFORD, as a centre for forestry instruction.—Schlich, 2274–85, 2445–6; Ward, 3503–4.

PAPER from wood pulp, see *Wood pulp.*

PARIS EXHIBITION, forestry exhibits at.—App. II. (xiii.).

PARRY, J. (Analysis of his Evidence).—Chief engineer to the Liverpool Corporation Waterworks, 3642. There are probably 14,000 square miles in Great Britain drained by rivers above the points of intake from which water is pumped to towns, including supplies derived from rivers, 3643. The latter source of supply will soon have to be abandoned for sanitary reasons, 3643. Many towns have formed, and now control for sanitary reasons, catchment areas for their water supply, amounting to about 576,000 acres, 3643. These gathering grounds are mostly in hilly, sparsely populated districts, which are peculiarly suitable to the growth of timber, 3643. The first to acquire a catchment area by Parliamentary powers was Manchester in 1879, 3643. The policy adopted to keep these gathering grounds free from pollution is to pull down the farms and residences to a large extent, 3643; hence the question arises, what is to be done with these areas, 3643, 3665. Planting would both contribute to the yield of water and give a reasonable return on the capital outlay in purchasing the land, 3643, 3701, 3710, 3715–22, 3731–2. The land usually has to be acquired by compulsion, which increases the cost, though Liverpool got its area by agreement, 3643, 3647–9. Lake Vyrnwy was formed in 1880; its catchment area is 18,500 acres, of which 14,600 acres are under 1,750 ft. altitude, 3643, 3711. Up to 1,500 feet there are 7–10,000 acres available for planting, 3711. At first the Corporation planted for ornament, but this was not successful, 3643. Mr. Fisher was then called in, and he made a report and recommendations as to the future management, 3643. These recommendations are being carried out, nurseries are being formed on the property, and 162,260 trees have been planted in the last five years, 3643–4, 3666–7, 3727–8. The total area of the plantations is now 470 acres, 3643. The annual expenditure is now about £200, 3643. There is difficulty with regard to cartage; witness cannot get more than 4d. for larch, which at the railway station 10 miles away would fetch 1s., 3643, 3661–2. It is hoped to work up the timber locally so as to reduce the amount of cartage, 3643, 3663–4, 3713–4; and ultimately special arrangements might be made for the transport, 3712–4. There is an obligation imposed on all waterworks to give compensation water, varying according to the season, 3643. This water gives the means of utilising mechanical power for sawmills, etc., 3643. Village industries should also be established below the watershed to use some of the wood, 3643, 3674, 3695; this would be of great benefit to the rural population, 3643, 3664, 3692–4. Has great difficulty in obtaining experienced foresters and technical advice, 3643–6. There is a large field for the training of such men, 3643, 3676, 3729–30. Liverpool acquired all the manorial rights, including grazing rights, 3650–1. Grazing rights are still in existence, but are held by the tenants who are now the Corporation's tenants, and the bulk are above the level of planting, 3650–6, 3679–85. Liverpool paid a fair agricultural value for the land, 3657–8. Does not think it would have paid to plant the area apart from the water question, 3659–60. The land was poor and mostly only good for grazing, 3668–72, 3680–5; worth about 1s. per acre, 3709. Engineers do not study forestry, 3675–6. Young men should be apprenticed to good foresters at places like Vyrnwy for most of the year, and attend for a term or so at a technical college, 3676–7, 3696–7. A large population was removed from the site, 3679–85. No difficulty was experienced in securing the grazing rights, 3651–6, 3686–7. The tenants appreciate planting, 3688–9. Large areas are suitable for planting in North Wales, 3689–90. There is much water-power available for industries, 3691. Work in the woods would provide occupation at slack times, 3692–3. Planting can be carried up to any height, 3698–700. Hoped that light railways would have proved more useful for timber, 3702–3. Railway rates are high, 3703–4. Rabbits give much trouble

at Lake Vyrnwy, 3705–8. Plantations do not render the water more impure, 3715–8, 3722–4. Sheep droppings are not a serious source of impurity, 3725–6.

Appendix XVII.—Statement showing the number of trees planted on Corporation lands around Lake Vyrnwy, 1896–1902.

PAVING, wood.—Margerison, 177–84; App. III.

PHEASANTS, injury by.—Selborne, 552; Havelock, 1133; App. VII.

PINASTER, imports.—Drummond, 2472–3, 2564.

PINE, SCOTS: (*a*) *Generally.*—Bailey, 393–5; Slater, 790–803; Michie, 3400–3, 3438–54; App. I., II. (xiii.), VI., X., XI.

(*b*) *Prices.*—Margerison, 167; App. VI., IX.

(*c*) *Quality* (see also *Conifers*).—Michie, 3419–20; Roberts, 3735–9, 3743–8; App. XVIII.

(*d*) *Ottawa pine.*—Croxford, 2755.

(*e*) *Yellow pine.*—Michie, 3356.

PITCAITHLEY, A. (Analysis of his Evidence.)—Is forester to the Earl of Mansfield, at Scone, 2630, 2657. There are no accurate records of the financial results of growing timber available, though they are very necessary, 2631–2; but there is abundant evidence that timber growing has in many cases paid very well, 2633–6. Forests in Scone have always been comparatively well managed, so that the examples of profits obtained there are exceptional, 2636–7. Rabbits were not troublesome in former times, but they are now, 2638–9. Woods in this country have generally been very badly managed, 2640–1. Prices for pit wood were much better 30 to 40 years ago, so that many people realised as much of their woods as possible, 2641, 2672, 2694–6. In many parts of the country, where the land is suitable for planting, the owners cannot afford the capital, 2642. Before increasing the area under timber, it would be better to improve the management of existing woods, 2643, 2662, 2706–7. The first step should be the provision of a forest school, with both theoretical and practical training, the latter coming first, 2644–50, 2685–7. Young men are taken on at Scone to be trained. 2651–4. Witness has no difficulty in getting labour, because the young men who come know that they will be looked after and get an education, 2651–4. A demonstration area should show all departments of the forestry business, 2655. A head forester ought to understand how to work up timber, 2656, 2718–9. Witness makes an estimate of the work to be done year by year, 2657–8. Land making less than 10s. per acre would, if suitable, do better under timber, 2661, 2704–5. Perthshire would be a good centre for a forest school, 2663; many foresters are trained there, 2664–5. Foresters would profit by any facilities for training, 2666–7. There is no special increased interest among factors or landowners, 2668. Grazing rights over the rough land would probably not be a difficulty in Scotland, 2670–1. It is essential to give facilities for education to secure the better management of woodlands, 2673–5, 2681. It has taken witness many years to acquire the knowledge he now possesses, 2676–80. The extension of forests will come with instruction, 2681–3. Foresters who have not had a special training are generally ignorant of many operations of forestry, 2688–90. This ignorance is due to their having had no means of acquiring information, 2689. A plantation which had not been thinned was formerly considered neglected, 2691–3, 2697. A scheme of management would prevent much improper cutting, 2695–6. A State demonstration area, serving as an object lesson, would be of use, 2698–9. Foresters hold diverse views as to the applicability of Continental methods in this country, 2700–2. We could grow better timber than is now imported, 2703. A poorer quality is now imported than formerly, 2703. Natural regeneration is impossible with ground game, 2708–14. The Blackwood at Rannoch is badly managed; there are a few fine specimens where the wood was originally dense, and there is some natural regeneration, 2710–4. Few foresters can measure timber accurately, 2714–7; or tell the cubic contents of an area, 2720–1. Witness does not believe in under planting, but does not object to mixing trees, 2707, 2722–3. Conifers do well in Perthshire, 2724. If woods were mortgaged, and a regular plan of felling were a condition of the loan, it would be impossible to cut woods before the proper time, 2725–6.

Appendix XI.—Profits on woods, necessity of education, ground game, cost of planting, sporting value of land.

PITWOOD.—Margerison, 82, 137–44, 168–9; Glanusk, 1383, 1393, 1445–53; Schlich, 2434; Drummond, 2472–3, 2498, 2518–24, 2563–6; Pitcaithley, 2641, 2672, 2694–6; Croxford, 2745, 2762; App. I., III., X.

PLANTING, cost of.—Ramsden, 618–21; Glanusk, 1382–90, 1421–6, 1480–3, 1513–7, 1531–44, 1560; Robertson, 1834–45; Vernon, 2083–6; App. I., II. (ix.), IX., XI.

POST OFFICE, evidence on behalf of,—Roberts 3733–81; App. XVIII.

PRICES: (*a*) *Generally.*—Margerison, 166–7, 203–9, 271–6; Havelock, 949–50; Glanusk, 1393, 1449, 1509–12, 1535–7; Davidson, 2069–72; Vernon, 2207; Schlich, 2265–6; Drummond, 2469–70; Pitcaithley, 2641, 2672, 2694–6; Croxford, 2737–8, 2755–6; Roberts, 3778-81; App. I., II. (xi.).

(*b*) *Specific quotations.*—Margerison, 167; Havelock, 1049–50; Forbes, 1330–4; Vernon, 2081; Webster, 3272–3; Michie, 3356; Parry, 3643, 3661–2; App. VI., IX., X.

PROFITS: (*a*) *Generally.*—Bailey, 335, 366, 2782–5; Selborne, 570–5; Ramsden, 625–7; Slater, 748–9, 790–814; Havelock, 876, 883, 924–30, 979–80, 989–94; Glanusk, 1382–7, 1518, 1574–5, Robertson, 1772–3; Davidson, 1907–9, 2049; Vernon, 2081, 2107–9, 2126, 2164–76, 2214; Schlich, 2271–3, 2290, 2323–5, 2355–7; Drummond, 2516–7; Pitcaithley, 2633–7; App. I., II. (viii., ix.), V., VI., IX., X., XI., XXVII.

(*b*) *Improvement in value of estate.*—Havelock, 1047–8; Vernon, 2202–3; Craigie, 2943–4.

RABBITS.—Margerison, 263–7, 294–5; Selborne, 516–7, 549–51, 598–600; Ramsden, 693–8; Havelock, 884–9, 971–6, 1094–5, 1133, 1138–40; Forbes, 1295–7; Glanusk, 1383, 1402, 1538–9, 1578; Robertson, 1632, 1825–9; Vernon, 2186–9; Schlich, 2336*; Pitcaithley, 2638–9; Parry, 3705–8; App. I., VII., XI.

RAILWAYS: (*a*) *Freight rates.*—Margerison, 18, 21, 137–44, 154–61, 189–94, 210–29, 244–6; Hopton, 328, 331; Havelock, 911–5; Robertson, 1651; Drummond, 2573–5; Croxford, 2738, 2751–4; Parry, 3702–4; App. I., III., IV., X.

(*b*) *Foreign, rebates.*—Hopton, 312–7.

(*c*) *Waggons, made of oak.*—Margerison, 185–8, 197–202; App. III.

RAMSDEN, Sir J. (Analysis of his Evidence).—Has planted large areas in Inverness-shire, 602–3: which should be profitable, 604–5. It is hard to find well-trained foresters, 606–7; the State should provide facilities for training owners and foresters, 608. Tithe is a heavy burden on plantations, 609–11. Is trying new conifers; the *Picea nobilis* and *Douglasii* do very well, 612–4. Some of his woods are many miles from a station, and the transport is a heavy item, so that he has left the thinnings on the ground, as it would cost more than their value to move them to the station, 615–7. His expenses of planting amount to about £2 12s. per acre, with another £1 for fencing, 618–21. It would be desirable to have a State model forest, if practicable, 622–4. The value of his plantations will be very great to those who come after him, 625–7. The salary of a forester is disproportionate to the capital value of the property he has to manage, 628–9. Education should make the woods more productive, 630–1. Forestry should be taught at the universities, 632–5. Rates and tithes are very heavy in proportion to the receipts, 636–40. It would

be a relief if woodlands were treated as agricultural land under the Act of 1896, 641–2, 692; but to relieve woodlands would only increase the rates on other land, 641–2. It would be better to increase the salary of foresters if we could get really good men, 643–5. It is desirable to instruct owners and then the foresters, 646–8. There is not so much disease when larch is mixed with other trees, 651–8. His Buckinghamshire beech woods might have been more profitable had his men been sufficiently educated to mix larch with the beech, 658–62. Witness has no revenue from his old woods, and his 10,000 acres of new woods are now coming to the time when they will want thinning, an operation requiring proper management, 663–72. More capable foresters are wanted, 673–7. The underwood from the Bucks woods is hardly saleable, but witness does not know how to render the woods more profitable, 678–86. Witness has not succeeded in getting his assessments to local rates reduced, 687–8. The tithe on his woods is highest where the land has long been under wood, 689–91. Rabbits are incompatible with profitable forestry, 693–4. In letting land for shooting, witness reserves the right to destroy hares, rabbits, roe-deer, and squirrels, which are all mischievous, 695–8. Witness always sends his manager for any information to Mr. Grant-Thomson, 673–6, 699–702. It would take a man a long time to learn much by visiting other woods in England, 699–705. It would be a great advantage to have a State model forest where a young man could go for training for a year or so, 706–9. The land planted in Inverness-shire was previously partly under deer and partly under sheep, worth not more than 2s. per acre, 710–17. It varies in altitude from 800 to 2,000 feet, but witness only plants for shelter above 1,500 feet, 718. The wages for managing agricultural land are much higher than for woodland, whereas on the Continent managers of forests are as highly trained as any land managers, 719–24. The rent of sheep farms has almost reached the vanishing point, 725–33. Owners of such land generally have no money for planting, 734–5; the State could buy land cheaply for afforestation in the Highlands now, 736. Witness does not find that his forester's operations are interfered with by the gamekeeper, 737–8.

Rates, local.—Margerison, 301; Bailey, 403; Selborne, 546–8, 590; Ramsden, 609–11, 636–40, 687–8; Havelock, 902–4, 936–42, 994–1006, 1105, 1109–12; Glanusk, 1404; Vernon, 2090–1, 2102–5, 2127–34; Drummond, 2480–3, 2500–2; Croxford, 2775–9; Maxwell, 2831–86; Minchin, 3156–9; App. I., IX., X., XII., XIX.

Railway rates, see under *Railways* (*a*).

Regeneration, natural.—Bailey, 393–5; Havelock, 1119–21; Vernon, 2076–80, 2173–6, 2232–5, 2255–6; Pitcaithley, 2708–14; Michie, 3394, 3469–70.

Rent above which it is not profitable to plant land.—Margerison, 44; Glanusk, 1508, 1576–80; Robertson, 1787–94; Vernon, 2179–81, 2215–6; Schlich, 2267, 2326–30, 2412–8; Drummond, 2628–9; Pitcaithley, 2661, 2704–5; Somerville, 3130; Michie, 3396–9; Parry, 3659–60; App. I., XI.

Roads in woods.—Margerison, 22–4, 45–8; Havelock, 899, 905–7, 943–5; Robertson, 1638; Schlich, 2324, 2377.

Roberts, M. F. (Analysis of his Evidence).—Assistant Engineer-in-Chief to the Post Office, 3733. English oak is superior to foreign as regards strength when subjected to torsional and splitting strain, 3734, 3751–6. Cannot speak as to durability, 3734, 3751, 3776–7. Baltic fir is more durable and better than British for telegraph poles, 3735–9. Cannot get long poles of British timber, 3736–8. Larch will not take creosote like fir, 3740–1, 3767–75. Some poles creosoted in 1870 are still in fairly good condition, 3741, 3749–50. Iron rods are sometimes substituted for wooden telegraph poles in towns only, 3742. Norwegian, Swedish, and Finnish red pine is used for telegraph poles, not Baltic white wood, 3743–5. North German timber is not so suitable, it is not so straight, and has less taper, 3745–8. English oak is more slowly grown, 3754–6. It is getting more difficult to get timber for telegraph poles, 3757–8; and the cost is rapidly increasing, 3778–81. Practically no home-grown timber is used for poles, the Post Office cannot get quotations, 3760–6.

Appendix XVIII. Post Office tests of timber for telegraph poles and cross-arms.

Robertson, D. (Analysis of his Evidence.)—Represents the Royal Scottish Arboricultural Society, 1581, 1849–62; is forester to the Duke of Sutherland at Dunrobin, 1582. Would have been glad to have had a training such as is given abroad, 1583–5, 1644. A State experimental forest is much needed, 1586, 1677–9, 1689, 1859. A practical training should be combined with theoretical instruction, 1587–8, 1734–41. All classes need instruction, 1589–92. Is in favour of State forests, 1593. There is much waste land which might advantageously be afforested, 1594–5, 1686–8. There is not much to be learnt from the Crown woods in England, 1596–7. A State demonstration area should be so chosen as to give as much variety as possible of soil, level, etc., 1598–1604, 1781–3. Skibo would be a very good site, 1600, 1782–3. Foresters generally have not much knowledge of the removal and utilisation of forest products, 1605–11. There is considerable expenditure on labour in woods, quite 20s. per acre per annum, 1612–4, 1667–72, 1818–9, 1895. The area and quality of wood are decreasing in Scotland, 1615–6, 1654–60, 1767–70. Trees can be raised cheaply in home nurseries, 1617–21. Many of the new conifers grow well in the Highlands, 1622–4. The cost of fencing ought not to be put down to the plantations, 1625–6. The cost of an ordinary 6-wire fence is about 5d. per yard, 1625–31, 1830–3; fencing against rabbits adds about 3d. a yard, 1632, 1825–9. A considerable area might be planted without interfering with the sporting rents, 1633. Timber is often sold too early because the owners want the money, 1634–7. The woods in the North are generally well laid out for removing the timber, 1638. The saw milling machinery might be improved if the areas under wood were larger, 1640. The continental methods of growing timber should be demonstrated, 1641–4. An object-lesson is what is wanted, 1644–5, 1689–92. The forester has not as a rule a sufficiently free hand, 1646–7. Squirrels do a great deal of damage in the north of Scotland, 1648–50. Railway rates are high, 1651. For short distances traction engines would probably be profitable, 1652–3. There is a desire for improvement among foresters, 1645, 1661–4. We can grow as good timber here as in Germany, 1665. A State demonstration area should be in Scotland, 1666. Woods give employment to clog-makers, bobbin mills, and such small industries in their neighbourhood, 1669–72. The Scottish Arboricultural Society's excursion to Germany created great interest in forestry, 1662, 1673–7. On many Scotch estates the factor, who may have no knowledge of forestry, has most influence over the woods, 1680–1, 1693–1700. Timber supplies from abroad will probably diminish, as the quality is falling off, and prices may probably rise, 1682–5. On many estates there is great irregularity in the quantities cut, 1700–5; this irregularity in the supply does not have much effect on the timber market, 1706–7. Timber merchants prefer to make arrangements for large quantities abroad, 1708–9. The quality is a more important factor in the price, 1709–10. A regular annual supply of timber would reduce the expenses, 1711–4. A thorough training is required to make proper working plans for a number of years ahead, 1715–7. Forest schools are required for training foresters, 1718–21, 1727–33. Witness got all his training and knowledge in the woods, 1721–6. The State demonstration area might be in connection with Edinburgh University, 1738–44; and should be under a thoroughly competent forester, 1742–4. The waste lands that are suitable for planting do not bring more than 1s. to 2s. 6d. per acre to the owner, 1745–8. The chief fault in management is over-thinning, 1637, 1749–51. On many estates timber is cut when money is required, there is no system, and no definite age is fixed beforehand, and at the end there is often left not more than a quarter crop of poor quality, 1752–7, 1764–6; a thousand acres in Inverness-shire fetched only £11 per acre; the stock was thin on the ground and rough

in quality, 1637, 1846–8. In thinning the best trees are often taken out instead of the worst, 1757–61. Vacancies in young plantations are often not filled up, 1762–3. The present system of managing woods is not profitable, 1771. Financial returns of woods as managed generally in the North of Scotland are no guide to what profits could be made, 1772–3. No special precautions are taken to prevent loss by blown trees, 1774–7. A landowner could put much of his land under systematic management without interfering with the beauty of his park, 1778–80. Land should not be planted if worth 5s. per acre for other purposes, 1787–8. Land that is not suited for cultivation will grow very good timber, 1789–94. The late Duke of Sutherland tried steam-ploughing, but only for agricultural purposes, 1795–7. Larch disease is decreasing in Scotland, 1798–1802. Larch grown from imported seed is less liable to blister, 1802. The new larches are very fast growers, 1803–6. Sheep farming is unprofitable in the Highlands now, 1807–9. Many Highland hills will only keep one sheep on five acres, 1810–3; sheep land is rented at about 6d. per acre, 1814–5. One shepherd could look after about 500 sheep, 1816–7; so that sheep-farming employs about one man on every 2,500 acres, 1817, 1823–5; whereas one man can look after about 100 acres of forest, 1818–25. Planting can generally be done for 25s. to 30s. per acre, 1834–5. A man can plant about 1,000 three-year-old plants per day, 1837–45. The planting iron is not used in the north, 1844–5. Forestry is much neglected, 1851–2. The Scottish Arboricultural Society has greatly increased the interest in forestry of late years, 1855–8. There should be State aid for forestry education, 1853–4. A forestry school, with cheap education, is desirable, 1860–5. Afforestation of land in the Highlands is a Government question, 1866–7, 1871, 1896; private owners will not do much for pecuniary reasons, 1868–70. Proprietors in the Highlands think that there is a likelihood of the Government stepping in, and do not therefore like to invest money, 1868. Experts should decide what land is suitable for afforestation, 1872–7. On a sheep farm of 14,000 acres in Ross-shire, with 4,000 acres of wood, there were about half-a-dozen shepherds, while the men employed on the timber portion ran from 100 to 200, 1878–84. Not many foresters' sons follow their fathers' profession, 1885. Elementary knowledge connected with forestry might be taught in primary schools in certain districts, 1886–7. Young men intending to be foresters should work on a Government area with a forest school, 1888–93; owners and factors should attend Universtity classes with expeditions to the experimental areas, 1891–2. Owners and factors should be instructed in the first place, 1892–4.

ROUMANIA, timber supplies.—App. II. (xi.).

RUSSIA, (*a*) *Imports from.*—Roberts, 3743–5.

(*b*) *Legislation.*—App. XXV., XXVI.

(*c*) *Timber supplies.*—Schlich, 2259; App. II. (xi.), (xiii.).

SALARIES of foresters and woodmen.—Margerison, 133; Bailey, 405, 461–7; Ramsden, 628–9, 643–5, 719–24; Havelock, 1051–2, 1126; Forbes, 1349–51; Glanusk, 1436–40; Schlich, 2396–400; Somerville, 3123–5; Webster, 3195–6, 3201, 3263–8; Michie, 3331, 3377–9; App. VII.

SAWMILLS.—Margerison, 25, 226, 305–8; Havelock, 879–80; Robertson, 1640; Croxford, 2740–1; Parry, 3643.

SAXONY.—Schlich, 2271–3; App. XXV., XXVI., XXVII.

SCHLICH, PROF. W.—Has been Inspector-General of Forests in India, and is principal Professor of Forestry at Coopers Hill, 2257. The excess of imports into Europe over exports is 2,600,000 tons, 2258. The net imports into the British Empire amount to about £17,850,000 annually, 2258; and into the United Kingdom alone to over £22,000,000, 2258; and these quantities have been rapidly increasing, 2258–60. The principal exporting colony is Canada, 2258. In Germany, imports are also rapidly increasing, and Germany, in 1899, imported 4,600,000 tons, mostly from Austria-Hungary and Russia, 2259. Germany will be a great competitor with England for Baltic timber, 2259. Austria-Hungary will not be able to continue to export at the rate it has done lately, 2259; the stock in Hungarian forests is 30 per cent. below the normal, 2259. The average consumption of timber in the United Kingdom is 14, in Germany 18, cubic feet per head per annum, 2259. Austria only produces 19 cubic feet per annum, so that when its industries are better developed it will require all its own production, 2259. In Russia, only 25 per cent. of the country has more forests than are required for home consumption, and 50 per cent. has less than it requires, 2259. Many merchants can now get better prices by selling the Russian timber within the country instead of exporting it to Germany, 2259. More timber is consumed per head of the population in the United Kingdom than 20 years ago, 2260. Of the total imports into this country, coniferous timber forms 87 per cent., 2262. The only large sources of supply of such timber are the countries round the Baltic and North America, 2262. China will require all it can produce, and in Argentina the difficulties of getting the timber out are too great at present, 2262. In spite of the considerable net export from the United States, that country consumes 33 per cent. more timber than the annual growth, 2262. Canada now exports as much to the United States as to the United Kingdom, 2262. During the last 30 years the exports from Canada have been stationary, 2262. If Canada introduced rational management of her forests, converting 10 per cent. of them into permanent forests, it could probably supply the whole world with coniferous timber, 2262. There are 800,000,000 acres of forest land in Canada, of which one-third are timber forests, 2262. There are no other sources of coniferous timber worth mentioning besides Canada and the Baltic countries, and there will be a shortage unless the Canadian woods are put in order, 2263–4. There is no probability of an immediate scarcity of hard woods, 2263. Degrees in forestry are given at three universities in the United States, and simpler instruction is given at 40 other colleges, 2263. The price of timber fell from 1870 to about 1886, but has been rising since 1894, 2265–6. There is a considerable field for afforestation in this country, 2267, 2360. There are 9,000,000 acres of waste land in Great Britain, besides the mountain and heath land used for grazing, amounting to another 12½ millions, or 21 millions altogether, 2267–9, 2358–9. The State might acquire areas for afforestation, 2269, 2293–4, 2302–7, 2361. There are 770,000 acres in counties within 50 miles of London unaccounted for in the Agricultural Returns, 2267–9. A committee of experts should be appointed to ascertain what portions of these areas could be made available for afforestation, 2270, 2299–304, 2361, 2451. Estimates of financial returns from woods in this country are generally untrustworthy, 2271, 2323–5, because the areas are not fully productive, 2271, 2323, and because other accounts are mixed up with them, which ought not to be charged to the forests, such as unnecessary roads and fences, 2271, 2324. As an example of what can be done, the forests in Saxony, which have been carefully managed since 1811–1831, show an increase since then in area from 354,000 to 412,000 acres, in production from 41 to 69 cubic feet per acre, in net receipts from 4s. to 18·4s. per acre, while the stock of standing timber increased from 2,128 to 2,618 cubic feet per acre, and the price from 2·04 to 4·68d. per cubic foot, 2271–3. One forest on average soil in the Anthonsthal range yields a net profit of 38s. per acre per annum, 2273. Forests can be grown at high altitudes when the productive powers of the soil are preserved; there may be difficulty at starting in this country because the soil in the areas which were formerly under wood have deteriorated through climatic influences, 2273, 2378. Education is required for various classes, 2274. For higher education there should be a faculty of forestry at one English university to begin with (Oxford or Cambridge) and one Scotch university, where a complete training could be given, 2274, 2439–47. Trained experts are wanted not only for this country but also the Colonies, which at present borrow men from the Indian Government, 2274. Proprietors should have the opportunity of learning the principles of sylviculture at the

university, 2274. Those intending to take up estate agency after leaving the university should also learn forestry as well as agriculture, 2274, 2440. For the higher education in forestry an estate of sufficient size within reasonable distance of the university, to be used as a teaching forest is necessary, 2274, 2280, 2314–7, 2381–3. Until one is acquired use might be made of instructive patches in woods on private estates, for instance, the Duke of Bedford's estates near Oxford and Cambridge, 2274, 2277. Students should also make excursions to the Continent until we have such areas, 2274. The Duke of Bedford's woods are under a working plan prepared by witness, 2274. The lower foresters should be trained in instruction forests, which should have a competent manager, 2274, 2315–7, 2406–8. The men would come to work in the forest and receive just sufficient pay for their food and keep, 2274, 2406–8. The manager should be competent to give all the practical and elementary theoretical instruction, 2274. As regards the intermediate positions of ordinary estate agents, provision ought to be made at the agricultural colleges for lectures and visits to instruction forests, 2274, 2355, 2448–50. Distinguished apprentices trained under the lower course should be given facilities to attend the courses at the agricultural colleges, 2274, 2409. Either Cambridge or Oxford would be a good centre for England, 2274–8, 2282–6, 2353, 2444–7. Many woods in the Chiltern Hills are probably more accessible from Oxford, 2277. In England one of the Crown woods might be made available, 2279, 2283–4. Witness would prefer several instruction areas, 2280–1. There should be an area in England and one in Scotland, connected with the university, 2287–8. Coopers Hill only trains students for India, 2290. The Indian Forest Department has about 20 million acres to manage, there are 200 English and 11,000 native officials, 2290. The forests in India have enormously improved in the last 40 years, and the net revenue from them has increased from 16 to 100 lakhs, 2290, 2355–7. The forest branch of Coopers Hill was established in 1885, and a fourth of the students at the college are forest students, 2290. Indian forest students undergo an entrance examination, and are then taught forestry, with cognate sciences, for two years, with excursions in the neighbourhood, and for 15 days to Normandy; in the third year they go to Germany to study for eight months at one centre, followed by a six-week's excursion chiefly through Germany, 2290. The Coopers Hill course is as good as it can be under the circumstances, 2291; but the student has not the advantages of rubbing against other people as at a university, 2291; and the teaching of the cognate sciences is arranged to suit the engineering rather than the forestry students, 2291. The woods near Coopers Hill are good for the study of forest botany, 2291–2. The Commissioners of Woods and Forests are putting some of the State woods under working plans, but other considerations are also involved, 2293. More might be done in the New Forest, and the Commissioners ought to face the outcry which would be raised if it was put under systematic management, 2293. The State might acquire forests as opportunity offers, which might be made available as instruction forests, 2293–4, 2310–3. Private effort should be stimulated chiefly by education, 2295, 2331, 2346–7, 2381–3. Landed proprietors should also form associations to assist in having centres of instruction, 2295. Loans might be made, on which interest should not be paid until the returns begin to come in, and which should then be paid off rapidly, 2295. There should be a Government expert always available to give advice and inspect woods, 2296, 2425–7. There should be at least one fully trained local assistant at each of the Crown forests, 2296–8. Some Corporations which have bought land for their water supply have also acquired the grazing rights, 2269, 2308. Caution must be exercised in the State purchasing land, so as not to bring heavy pressure upon the population, or where the difficulties are considerable, 2308–12. Retired Indian forest officers might be put in charge of these instruction forests, 2317; or the forest might be managed by the University professor, 2320, 2402–4. These forests should be managed so as to yield the highest possible profit, 2318–9, 2405. The Commissioners of Woods and Forests can only control 16,000 out of a total of 63,000 acres in the New Forest, 2321–2. Land used for agricultural purposes should not be diverted to forestry, 2267, 2326–30. No general statement can be made as to the altitude up to which land may be planted, 2328; nor as to the rental below which it would be profitable to plant, 2329. Whether land is suitable for planting depends upon local conditions, 2328–30. There cannot be a large proportion of State forests in this country under present conditions, 2331, 2369. Some of the Irish Congested Districts Board's attempts to afforest land have failed through lack of knowledge of forestry, 2330–5. The plantations at Knockboy failed because the trees were planted on the wrong side of the hill, exposed to gales and salt spray, and owing to the boggy nature of the ground, 2333–6. Boggy ground cannot be successfully planted if the bog is more than 1½ yards deep, unless drained, 2333.* The unfavourable results in Ireland are not evidence against State afforestation, 2334–6; they are an argument of the necessity of trained experts, 2335–6. Red deer do much damage in Germany, and rabbits are increasing, 2336.* Land is not more uniform in Germany than in England, 2337–44. There is an increased interest in forestry in late years, 2345. There should be class rooms at the model forest, 2350–2. It is important that the sons of landowners should have some forestry education, 2354. There is probably a larger area available for planting in Scotland than in Wales, 2362. The State forests which are likely to be established should be used for the collection of data, and serve as model forests under different circumstances, 2363–4. State forests could be made remunerative, 2365–7. State forests should only be acquired in Great Britain to serve as training grounds or the collection of data, 2366–9. Woods in this country do not produce as much as they ought owing to errors of sylviculture and of management, 2370–6. With such scattered work it is not possible to make full use of mechanical means of transport, etc., 2376–7. The advantages of good roads are often overlooked, 2377. Our soil and climate are as suitable as those of Germany, 2378–9. The soil is not exhausted by growing woods, but woods, in their natural state, go on for ever, 2378–80. Some people do not replant because of the insects but in Saxony the insects are trapped and got rid of, 2379. A demonstration forest would be useful for teaching some things from the very beginning, 2384–6. County Council lectures would be very useful, 2387–8. The demonstration areas should be State or Corporation, to ensure continuity of management, 2389–91. Artistic beauty of forests can be combined with economical management, 2392. The extension of the forest area would be valuable to agriculture, 2393–4. The labour question is also important, 2395. The salary of foresters is low considering the capital value of the stock they have charge of, 2396–2401. Estates with large areas of wood ought to be in charge of one or more men who have had a thorough training during several years, and in receipt of large salaries, 2397–9. The State demonstration area should be at least 2,000 acres, 2410–1. Strong plough land which went out of cultivation 20 years ago should have been planted, 2412–8. Land which provides food should not be taken out of cultivation; cheap corn will not always come from America, and prices of grain will rise again, 2417–20. Landowners, in planting timber, are planting a crop which will probably increase in value in view of the probable shortage of timber, 2421–4, 2433. It is difficult to recommend particular trees to grow; probably larch, Douglas fir, and ash are as profitable as any, 2428–32. As good pitwood can be grown here as on the Continent, 2434. Coniferous timber with large rings is generally assumed to be less substantial than when grown close, with narrow rings; with broad leaved trees it is the other way round, broad rings probably indicating better quality, 2434–6. Larch, planted with beech, is less liable to disease, 2436–8. Forestry must not be attached to a chair of agriculture or botany, 2441–3. University students should go abroad, for part of their practical course, as at Coopers Hill, until we have the necessary demonstration forests in this country, 2452.

Appendix II. (xi.).—The outlook of the World's timber supply; area of forests in Europe; imports and exports of European countries; imports into United Kingdom; timber supplies of Germany, France, Belgium; consumption in different countries; timber

industry of Roumania, Norway, Sweden, Russia; supplies of non-European countries, United States, Canada; timber supplies of British Empire.

SCHOLARSHIPS, see under *Education* (*f*).

SCOTS FIR, see under *Pine*.

SCHWAPPACH, Dr. A.—Report on a visit to the forests of Scotland: Condition of woods in Scotland; mismanagement; afforestation of waste land; profits and expenses; economic importance of forests; British arboriculture; suitability of climate, etc.; recommendations as to sylvicultural management; App. II. (ix.)

Information as to the assistance that foreign States give to planters, and the encouragement they offer to the afforestation of waste lands: State assistance by various forms of instruction and inspection; pecuniary assistance by payment of part of the cost of planting or premiums; credit institutions; remission of taxation; distribution of plants or seeds; co-operative societies; seed control stations; State officials permitted to manage or give advice concerning the management of private woods; advisory experts attached to chambers of agriculture and similar societies; work performed by the Brandenburg Chamber of Agriculture, App. XXV.

Review of the restrictions, in the public interest, that States place upon individuals owning forests: Legislation concerning protective and non-protective forests; mountain slopes and sand dunes; prohibition of deforestation; requirement to afforest; regulations for the prevention of mismanagement; prescriptions requiring certain methods of management; State requirements concerning the training of foresters employed in private woodlands; compulsory afforestation; State supervision over private forests; App. XXVI.

SEASONING of timber, artificial.—Croxford, 2749–50.

SEEDS, distribution of, and seed control stations abroad; App. XXV.

SELBORNE, EARL OF. (Analysis of his Evidence).—Has had a working plan prepared for the woods on his estate by Mr. Nisbet, and manages them on a regular system, 508–10, 525–30, 568–70. Forestry is of great importance to landowners, and timber will be more valuable in future, 510*. Much agricultural land could be profitably put under timber, 511–3. All classes stand in need of education, but owners should be instructed first, 514–6. Rabbits and forestry are incompatible, 516–7, 549–51. Mice also do much damage, and are encouraged by the destruction of weasels, hawks, and stoats, 517, 549–50. The man who does not keep ground game has to protect his estate against those who do, 518; and it would be reasonable that he should claim the fencing off of rabbits, 531–2. Instruction in forestry should be provided at the universities, 520–4; landowners would not abandon their university course to attend for a couple of years at a special school, 521–2. The man who carries out a working plan prepared by an expert need not necessarily have an extensive knowledge of forestry, when the woods are visited periodically by the expert, 525–30. The men who work in the woods are ignorant of many operations in forestry, 533–4. There is a little shortage of labour, but landowners would be willing to pay a little more for good woodmen, 535–7. Witness has planted chiefly conifers, 538–40; he has given up pure larch plantations because of the larch disease, 541–2; which was introduced through injudicious cutting of branches, 542–6. It would be a great help to be relieved of rates, 546–8. Game, apart from rabbits and hares, do no damage, 549–53. Mr. Nisbet inspects the woods every year, 525–7, 554–8; the work is being better carried out than it was at first, 557–60. Witness's woods contained a great deal of copse, but the value of the underwood is not a fifth of what it was, and he proposes to grow more timber, 561. The crops are not yet sufficiently dense to require thinning, 562–3. It would be a good thing if there were a State demonstration forest, such a forest being part of the forestry school, 564–7. The area of witness's woods is about 400 acres, 568–70; and he has found a working plan useful even for so small an area, 570. Witness's woods are already beginning to yield a little more income than before, 570–5. If a faculty of forestry were started at the universities, the lecturer should also give a condensed course, suited to those who may have to manage woods, 576–8. It is of more importance to educate the owners and agents in the first place, 578–80. His bailiff would not be able to carry out the working plan without Mr. Nisbet's annual visit and witness's own supervision, 581–6. State afforestation of waste areas would be a good thing, 587–8. A complete scheme of education would be a State model forest in connection with the universities, 589. Cannot say that tithes, rates, and death duties are a real bar to plantations, 590. The continental woods are not less beautiful than English, 591–2. Forests help to maintain the population on the land, 593. Experiments should be carried on in connection with model forests, 595. Japanese larch is not entirely immune from disease, 595–7. The timber of Japanese larch will probably be as good here as in Japan, 597–8. Rabbits do not touch the Corsican pine, 598–600.

SELECT COMMITTEE of 1885-7, summary of evidence. —App. I.

SELMECZBANYA.—Bailey, 454 7, App. II. (ii.).

SETTLED LAND ACTS.—Craigie, 2920.

SHAKE.—Margerison, 251–5, 261, 292–3.

SHEEP: (*a*) *Farming* (see also *Grazing rights*).—Ramsden, 710–7, 725–35; Slater, 750–4; Glanusk, 1408–10, 1561–4; Robertson, 1807–25; 1878–84; Davidson, 2004–20; Drummond, 2505; Webster, 3216–7, 3241–3; Michie, 3421–37; Parry, 3668–72, 3680–5, 3709.

(*b*) *Injury by*.—Glanusk, 1561–2, 1572–3; Vernon, 2188; Drummond, 2514–5; Michie, 3394; App. I.

SHELTER: (*a*) *belts to protect woods*.—Margerison, 38; Bailey, 373, 399–402; Robertson, 1774–7; Webster, 3258–60: App. I.

(*b*) *For farming*.—Ramsden, 718; Havelock, 1106–12; Davidson, 1921, 2054–7; Drummond, 2517, 2591, 2599–603; Webster, 3213, 3241–3; Parry, 3688–9; App. XXVI.

SILVER FIR.—Bailey, 339–402.

SLATER, A. (Analysis of his Evidence.)—Is land steward at Osborne, and has had experience in Scotland, 740–1. A model forest with a school in connection is required, 742–6, 826–7. British woodlands are not in a satisfactory condition, 747; but with improved methods forestry would be very profitable, 748–9. There is much waste land and sheep farms which could be profitably afforested, 750–4. Foresters are, as a rule, anxious for instruction, 755; they generally know their practical work, but not the scientific part, 756–62 768–72. A State model forest should illustrate all operations, 763–5. Planting is not carried on to a great extent, 766. Owners and agents do not know much about the practical working of their woods, 767. Foresters should have a training in woods, and then spend, say, a couple of years at a school; this would be preferable to training them, while working as employés, in the State model forest, 771–81. Students cannot get practical training at the Botanic Garden, Edinburgh, because there are no woods, 742, 782, 857–8. Owners and agents should be instructed in the principles of sylviculture, and foresters in these and the practice also, 783–9, 847–56. A mixed plantation of 40 acres of larch and fir, on land not otherwise worth more than 1s. an acre, has returned 7s. per acre after allowing for expenses and calculating interest at 3 per cent., 790–803. If interest had been taken at 2½ per cent., at which Government can borrow nowadays, the profit would have been much greater, 804–14; so that it would pay the State to invest money in such land, 811–14. The desire for instruction among foresters has

greatly extended during the past few years, 815–20; the excursions abroad made by the arboricultural societies have greatly contributed to this feeling, 821–5. Owners are interested, but have not much knowledge of the subject, 828–31. There is no scarcity of labour, 832–37. The larch sold by witness fetched 1s. per foot, the spruce less, 838–40. Witness has taken a great interest in forestry education, 841–3. The State should provide opportunities for education, 844–6. The example of an area of poor land of which the value has been increased by planting is within an hour of Edinburgh, 859–61. A school should be on the forest area and close to Edinburgh, 862–4. Witness cannot speak as to loans for planting, 865–69. Foresters do not generally understand thinning, 870–1. Woods should be managed upon a working plan, 872–3. A model forest would also serve for conducting experiments in forestry, 874.

Appendix V.—Example showing the outcome of 40 acres of mixed larch and fir woods at the end of the 75th year.

SLIDES.—Margerison, 151–3.

SOMERVILLE, DR. W. (Analysis of his Evidence.)—Assistant Secretary to the Board of Agriculture, formerly Professor of Agriculture at Durham and Cambridge, 2994. Is President of the English Arboricultural Society, 2987. Agrees with the schemes of education recommended by Col. Bailey and Dr. Schlich, 2990, 3041. Local lectures and local instruction have also certain advantages, as has been done in Northumberland and Aberdeenshire, 2990–2, 3049–50, 3054, 3099–113, 3133–6. The lectures given during the less busy months at Hexham attract the working foresters, and also men employed in nurseries, 2990–1, 2996, 3006–7, 3105–10. The Northumberland and Durham County Councils gave scholarships sufficient to pay the travelling expenses of those attending such lectures, 2991, 3009, 3012–7. These lectures, both at Hexham, and at the college at Newcastle, were well attended, by about 20 to 30 students, 2991, 3005–8, 3104. County councils should also start forestry demonstration plots on the experimental farms attached to the agricultural colleges, as has been done by Northumberland, 2992–3, 3016, 3055. Forestry is required for the B.Sc. in the Department of Agriculture at Durham University, 2994, 3056. Lectures on forestry are given at Cambridge, but it is a voluntary subject there, 2994–5, 3057–9; the lectures at Cambridge were much appreciated, the class numbering 12 to 15, 2994–5, 3018–22. The lectures at Cambridge were largely attended by the landowning class, while at Hexham they were chiefly working foresters, 2994–7, 3072. The landowners stand first in need of education, and they can be attracted by providing instruction at the universities, 2998–9, 3072, 3126–9. There are few good woods near Cambridge, 3000, 3023–4, 3069; but the students there could make tours abroad, 3001. A considerable extension of the forest area could be profitably made, 3002, 3063; but improvement would best result from training the private owner, 3003–4. Prejudice in regard to agricultural education has been overcome in recent years; but in forestry there is no prejudice to overcome; the present condition of forestry is due to the ignorance of the landowner, 3025–37. There are experts who give advice, and an increase in their numbers would be desirable, 3038–40. The forester wants instruction rather as to diseases of trees, principles of tree growth, and methods of planting and felling, etc., the landowner rather in the economics of the subject, 3042–4, 3138–9. The annual expenses of the forest school would be about £600 to £700 a year; it could be run by two special men, one teaching sylviculture and mensuration, the other teaching the underlying natural sciences, 3045. The instruction forest must be worked so as to be a financial success, 3046–7, 3139–41. A small portion of the area would form an experimental ground, not intended to give financial success, 3047–8; and its accounts should be kept quite separate, 3140–1. The number of men capable of giving instruction is limited, but they are increasing, 3051–3. There are text-books in forestry, but witness does not know of an elementary primer, 3060–2. Foresters can obtain the transactions of the arboricultural societies, 3060–1. An expert committee to determine what areas might with advantage be planted would furnish valuable information, 3064–5. The course given by witness at the Durham College of Science reviewed the whole subject in about 30 hours' instruction, with excursions, 3066–9. At Cambridge in 30 hours' instruction he had not to teach forest botany and entomology, 3070–1. Students at Cambridge have other subjects to learn, and we should aim at giving a 50 hours' course annually in forestry proper to begin with, 3072–4. Those who want to specialise ought to go to Coopers Hill, 3075. The number of qualified instructors required by county councils need not be large, if they lecture in several counties by making suitable arrangements, 3076–8, 3111–3. There is plenty of suitable land, worth not more than 5s. per acre, for a demonstration forest near Cambridge, 3079–81; but the tithe would be a heavy burden, 3081–5. Apart from larch disease, insects do far more damage than fungi, 3086–9; so that the study of entomology is quite as important as that of fungi, 3090. The number of dangerous fungi is something under half a dozen, 3091; the corresponding number of insects is not much more than six, 3092–6; many injurious insects do not attack healthy trees, 3096. Injurious insects can be much more easily checked than fungi, 3097–8. A suitable course for county councils would be one evening lecture for 20 weeks, 3099. The lectures at Hexham were given in the evening, 3100. There should be permanent centres of instruction at Edinburgh and Aberdeen, 3114–5. There are men available to give instruction, who have gone through a course in this country, and subsequently taken a complete course on the continent, 3053, 3116–9. Forestry plots on the experimental farms of agricultural colleges should be under the charge of a competent person, 3120–2. The salaries of foresters are low in proportion to the interests committed to their charge, 3123; and when landowners are educated to realise the value of their woods, these salaries might be on a higher scale, 3124–5. This does not mean that the estate would be weighted with heavier charges, 3125. On poor land timber pays better than crops, 3130. There is not room for the very small holder in the production of timber, 3131. Bird destruction has not materially increased damage by insects, 3132.

SPAIN, education.—App. I.

SPARKS.—Margerison, 38; Bailey, 373.

SPORT (see also *Game*).—Davidson, 2014–5, Craigie, 2947–53; App. II. (ix.); rating of, App. XIX.

SPRUCE.—Drummond, 2497, 2525–30, 2560–4; Croxford, 2738, 2745–8, 2760–4; Roberts, 3744–5; Webster, 3280; App. IX., X., XI.

SQUIRRELS.—Ramsden, 695–8; Glanusk, 1402–3; Robertson, 1648–50.

STATE AFFORESTATION, see *Afforestation*.

STOATS.—Margerison, 300–1; Selborne, 517, 549–50.

SUCCESSION DUTIES, see *Death Duties*.

SURVEYORS' INSTITUTION.—App. I.

SWEDEN: (*a*) *Imports from.*—Vernon, 2206; Roberts, 3743–5.

(*b*) *Supplies of timber.*—App. II. (xi.).

SWINE.—Vernon, 2188.

SWITZERLAND, legislation.—App. XXVI.

SYCAMORE, prices.—App. VI., X.

TAXATION, remission of, in foreign countries.—App. XXV.

See *Death Duties*, *Rates*, and *Tithes*.

TELEGRAPH POLES and arms.—Roberts, 3733—81; App. XVIII.

THINNING.—Margerison, 63–4; Bailey, 335, 386; Selborne, 562–4; Ramsden, 615–7, 672; Slater, 870–1; Havelock, 1093; Forbes, 1370; Robertson, 1757–61; Pitcaithley, 2691–7; App. I., II. (ix.), VII.

THISELTON-DYER, Sir W. T.—Diminution of world's supplies of timber; necessity of educating competent men for the Colonies; training of students for the Indian Forest Service, App. XX.

TIMBER: (*a*) *Preparation* (see also *Creosoting*).—Margerison, 18, 111–21, 210–29, 244; Drummond, 2499; Croxford, 2738–9, 2743, 2751–4; Parry, 3643, 3663–4, 3713–4, App. III.

(*b*) *Prices*, see *Prices*.

(*c*) *Production, consumption, and supplies.*—Schlich, 2258–64; App. II. (xi.).

(*d*) *Probable scarcity.*—Margerison, 53–5, 124; Bailey, 335, 371–2, 408–14, 441–2; Selborne, 510*; Robertson, 1682–5; Davidson, 2066–72; Vernon, 2160–1, 2200–1; Schlich, 2258–66, 2421–4, 2433; Croxford, 2734–5, 2757–9, 2767, 2772, 2780–1; Webster, 3188; Michie, 3315, 3354–7; App. I., II., (viii., x., xi., xii.), XX.

(*e*) *Quality.*—Margerison, 3–9, 40, 69–73, 93–108, 185–8, 197–202, 239–43; Hopton, 325–9; Bailey, 335, 371, 437–45; Havelock, 881–2; Robertson, 1665; Schlich, 2434–6; Pitcaithley, 2703; Croxford, 2730–35, 2747–50, 2755–6; Webster, 3203–4; Michie, 3438–47, 3452–4; Roberts, 3734–66; App. I., III., XVIII.

(*f*) *Regularity of Supply.*—Margerison, 15–8; Bailey, 335, 396–8; Havelock, 1063; Robertson, 1700–9; Webster, 3306; App. I.

(*g*) *Timber Trades Federation, Evidence on behalf of.*—Margerison, 1–310: Hopton, 311–31; App. III., IV.

(*h*) *Used on Estate.*—Margerison, 301; Havelock, 911–4; Webster, 3204–5.

TITHE.—Selborne, 590; Ramsden, 609–11, 636–40, 689–91; Glanusk, 1404–8; Vernon, 2102–5; Drummond, 2483; Somerville, 3081–5.

TRACTION ENGINES.—Margerison, 20, 230–8, 305–8; Havelock, 908–10, 1066–75; Forbes, 1352–3; Robertson, 1652–3; Drummond, 2471, 2474, 2576, 2621–3; App III.

TRAMWAYS.—Margerison, 151–3.

TRANSPORT (*a*) *Road* (see also *Traction Engines*).—Margerison, 22, 44–8, 56, 75, 114–23, 145–53, 301–8; Ramsden, 615–7; Havelock, 899, 905–10, 943–7, 1064–5; Glanusk, 1499–508; Robertson, 1638; Vernon, 2092; Schlich, 2376–7; Drummond, 2470; Parry, 3643, 3661–4, 3712–4.

(*b*) *Rail*, see *Railways*.

UNITED STATES: (*a*) *Clearings in.*—Bailey, 372.

(*b*) *Imports from.*—Vernon, 2206.

(*c*) *Improvement of forests.*—App. II. (xiii.), XXV., XXVIII., XXIX.

(*d*) *Supplies.*—Schlich, 2262–4; App. II. (xi.).

UNIVERSITY, see *Education*.

VERNON, A. (Analysis of his Evidence).—Is land agent and surveyor. Has had a long experience of beech woods in the Chilterns, 2073–4. There has been a large reduction in the area under wood in that district during the last half-century, 2075. Beech succeeds best when naturally regenerated, and this system is encouraged as much as possible in Bucks, 2076–80. The gross yield of the beech woods varies from about 15s. to £2 per acre, 2081, 2107–9, 2164–76; the cost would probably be about one-third, 2109, 2165–6. Larch, under suitable conditions, may be even more profitable, 2082. Planting and fencing larch cost £8 per acre on the average, 2083–6. There are large areas which might be brought back to timber cultivation, 2087. Landowners might plant more if they could obtain loans under supervision, but there are difficulties, 2088–9. New plantations should be exempt from rates for 25 years, 2090–1, 2104–5, 2127–34. Improved methods of teaching forestry are required, 2092–3, 2139. Increased facilities for transit are wanted, 2092. Owners and agents should be more technically educated than woodmen, 2093–8, 2142, 2191–3. Woodmen are unable to profit by theoretical training, 2093–8, 2190–3; and learn their duties best in the woods under the agents, 2093. Some of the best beech woods in the Kingdom are in witness's district; they should be cut at regular intervals without lessening the annual quantity, 2096. Head foresters on large estates rank almost with agents, and can profit by education, 2098–9. Foresters are attached to single estates, 2100–1. Tithe and rates together are very heavy, and often double the cost of forming the plantation, 2102–3. Tithe cannot be remitted, 2104–5. Assessment committees generally rate woodlands the same as adjoining agricultural land, whereas it is generally rather worse, 2105. Ash is a very profitable timber, 2106. Is not in favour of State forests, 2110. A State experimental area would be desirable, 2111–2. The area of the beech woods round Wycombe is about 20,000 acres, 2113. Wycombe is the centre of the chair trade, 2114–6; but the district now uses chiefly imported material, and only 10 per cent. of the beech used is produced in the neighbourhood, 2116, 2209–10; although all the produce from the beech woods goes into the chair trade, 2117–8. If the area were extended, the beech would all find a market at Wycombe, 2119–22. The rotation is about 70 years, 2122–4. The maximum cubic capacity is about 2,000 cubic feet per acre, worth about £200, but that was a few large trees, 2125, 2252–4; an ordinary beech wood ought not to be worth more than £60 to £100 per acre to pay best, 2126. In relation to the produce, the rates on existing woods are not high, but are unfair compared with the agricultural land, 2131–4. The management of some of the woods might be improved, 2135–41. Where woods are of sufficient area they should be under a good forester, 2143. His visits to woods abroad have stimulated his interest in forestry, 2144–6. A State demonstration area is desirable, but we could not attain such great examples as abroad, 2147–52; the land in this country is not sufficiently uniform, 2151, 2196–7. There are small industries around Wycombe giving employment and helping to prevent rural depopulation, 2153–8. There is a smaller percentage of land under wood in this than in other countries, 2159. Cannot give an opinion as to the diminution of the timber supply abroad, 2160–1. The cessation of the demand for oak for the Navy has contributed to discourage forestry, 2162. The Hughenden Woods yield about 28s. per acre net, annually, without the stock being reduced, 2164–9, 2176. Similar results are shown by other woods in the district, 2170–2. These woods are naturally regenerated, and the timber taken out regularly, 2173–6, 2255–6. The local "load" of timber is 25 cubic feet, 2177–8. Ths land under these beech woods, if used for agriculture, would not be worth 10s. per acre, 2179–81. The system followed in these beech woods is one of the Continental systems, 2182. There are instructive examples of well managed woods in this country, 2183–5. Rabbits are kept down, 2186–9. Sheep and cattle are kept out, but pigs are supposed to do good, 2188. An area for demonstration attached to a forest school would be very desirable, 2194–5. There is too much cutting and too little planting in England, 2198–9; the stock of home-grown timber is decreasing while there is an increasing use for it, 2200–1. An estate is more valuable when there is timber on it, 2202–3. Owners have had less capital to spend on planting in late years, 2204–5. The bulk of the foreign timber used at Wycombe is Canadian and American birch, which comes in planks of convenient size, 2206. Chair parts, ready to be made into chairs, are now being sent over from Canada and Sweden; this trade is becoming gigantic, 2206. Prices do not seem to have been lowered, but home-grown wood would have gone up were it not for the imports, 2207. Mahogany and other fine woods are used for certain chairs, 2208. University education is too dear for most; County Council classes would do good, 2211–3. Owners do not plant because they do not

get any return for many years, 2214. 100 acres of arable land require three men to work it, of pasture one man ; and woods would not require more than one man per 100 acres, 2215, 2220–1, 2245–7 ; besides the men for felling, 2246–8. Good pasture land should not be broken up into plantations, 2215–6. Would not object to waste lands being gradually afforested by the State ; there is too much imported for such State action to affect the price and so compete with private owners, 2217–9. Afforestation of waste lands would give employment, 2220–6. The development of the chair industry was due to the existence of the beech woods, 2113–5, 2209, 2227–8. We might expect industries to be started if there were forests in other out of the way places, 2228–30 ; but some beech forests in the Alps have only developed fire-wood and a little carving, 2230–1. Full beech-mast years occur every third or fourth year, 2232–4. No preparation of the soil is made to bury the mast, 2234–5. Larch grows well in the district, 2237–41. Quick grown beech sells rather better than slow grown, which is hedgerow timber, and harder to work, 2242. There is never complete canopy in these beech woods, 2243–4. Besides the men engaged in the woods, the chair industry maintains many persons, 2249–50. The beechwood output is 50–60 feet per acre annually, 2250–1. Beech is occasionally sown (not planted) artificially, but not to any great extent, 2255–6.

Appendix IX.—Particulars of beech woods in Bucks approximate values of timber in 1902 ; and amount of sales of timber during several years on certain estates, with acreage and average price.

Vyrnwy, Lake.—Parry, 3643–728 ; App. XVII.

Wages, see *Salaries*.

Wales.—Glanusk, 1381–578 ; Davidson, 2063–5 ; Schlich, 2362 ; Drummond, 2453–629 ; Webster, 3188–91, 3209–62, 3269–73 ; Parry, 3650–60, 3668–72, 3679–700 ; App. X.

Ward, Professor H. Marshall. (Analysis of his Evidence).—Professor of Botany, represents the University of Cambridge, 3492–3. Cambridge would be an admirable centre for theoretical instruction in forestry, 3494–5 ; but there are no forests for practical instruction, 3494–5, 3510–2, 3543. Young plantations could be established in a short time near Cambridge, 3496. Forestry on the Continent is much better than in this country, 3497. It would be preferable to find a forest for illustration in England and Scotland rather than send students abroad to study, 3496. Cambridge would probably not be a good locality to form a demonstration forest, 3498–500. A complete forestry course could be given at Cambridge if combined with tours at home or abroad, 3500–2. Oxford or Cambridge would be the best centre for landowners, 3503–4. The theoretical instruction should be given first and completed by a subsequent technical training in the forest, 3505–6, 3606, 3610–24, 3633. Forestry is an important department of rural economy, 3507–8. There are large tracts of country which might be profitably afforested, 3509. Would not suggest a chair of forestry at Cambridge owing to the lack of forests, 3510. Cambridge is not analogous to Coopers Hill, where there is a large area of wood, tracts of which were until a year ago under the control of the Professor there, 3511–3. It is doubtful how far technical forestry is a subject for university education, 3513–4, 3607–9. There are no forests under the control of Munich University, 3415–7. Cambridge could turn out men ready to become foresters, 3518–20. There is land of sufficiently low value to be suitable forest land near Cambridge, 3521–4. It would take some time to get to Woburn, 3525–6. Model illustrations of planting might be formed near Cambridge, 3527–8. If funds were available, the University would welcome such teaching, 3529–31. Witness would be willing to encourage the study of botany as affecting forestry, 3532–5. Instruction in forestry would be attractive to students, 3504, 3536–40. The forest is the laboratory of the forester and essential to the teaching, 3527, 3541–2, 3551. It would take a long time to establish a complete forest near Cambridge, 3544–6. The students would probably be willing to go abroad, 3547–8. Most of the continental forestry schools have forests attached, 3549–50. There is a model farm for the practical illustration of agriculture at Cambridge, 3552. The training of a forester should be an extension of his training as a botanist, 3553–8. A good forester is impossible unless he is a botanist, 3558–68. A student could obtain a sufficient knowledge of the sciences underlying forestry in two or three years, 3568–71, 3636–7 ; an equivalent knowledge is successfully given in agriculture now, 3570. He would require two years for the technical training in the forest, 3572–7 ; but this might partly dovetail in with the theroetical instruction, 3573–4, 3638–40 ; so that the whole need not occupy more than three to four years, 3574–82, 3641. Botany and other sciences would be taken concurrently, 3569–71, 3583–4. Has not given the details of courses other than botany, 3585. Botany is the most important of the fundamental sciences in forestry, 3586, 3592–3, 3597, 3601–4. A forester should be as thoroughly instructed in entomology as the study of fungi, 3586–7. Some knowledge of mathematics is necessary in forestry, 3588–91, 3594–6, 3598–600. Botany is not the sole foundation of forestry, 3591, 3605. Some zoology should be taught, 3614. Witness's scheme is intended for head foresters, 3625–9 ; large forests should be under very competent men, 3629. If the teachers could be got the better arrangement would be a forest school for foresters, 3630–1 ; one teacher of natural science and one of practical forestry for young foresters at such a school would be insufficient, 3632–5.

Appendix XVI.—Outline sketch of forestry course.

Waste lands, see *Afforestation, areas available for*.

Water supplies, afforestation of catchment areas.—Margerison, 76–80 ; Havelock, 900–1 ; Glanusk, 1528–30 ; Davidson, 2032–42 ; Schlich, 2269, 2308 : Drummond, 2536–8 ; Parry, 3642–728 ; App. XVII.

Weasels.—Margerison, 300–1 ; Selborne, 517, 549–50.

Webster, A. D. (Analysis of his Evidence).—Represents the Royal Horticultural Society, 3187 ; has managed woodlands in England, Wales, and Ireland, 3189–90. One inducement to planting is the high price of timber and the chances of a timber famine, 3188. Plantations can be established on exposed hill sides, 3188. Timber paid well, when laid out for paying, on the Penrhyn Castle estate, 3191–1*. Game and timber do not go together, 3191*, 3208. Witness was trained under his father and had been at a school in connection with forestry, 3193–4. Many foresters would be glad to learn, 3195 ; but the salary of a forester is too low to make it worth his while, 3195–6, 3201. Foresters should be educated by serving an apprenticeship for three years, and then working in State forests, which should be established on waste lands, with a few forest schools in connection with them, 3188, 3197–9, 3207, 3255–7. Landowners and agents do not know much about forestry, 3200. It is not necessary to train owners and agents, 3202. There is a dearth of competent foresters, because the wages are too low, 3201, 3266–8. The quality of home-grown timber is improving, 3203–4. More timber might be used on the estate than is done at present, 3204–5. Most foresters are not competent to deal with the manufacture, valuation, and transport of timber, 3206. Witness has planted a good deal on Welsh hillsides above Bangor, 3209–13, 3234–6, 3244–9, 3284–5. There were no rights of common on these hillsides, 3214–6. The rent of the ground, for sheep farming, was previously about 5s. per acre, 3216–7. These plantations have sheltered the land so that the farmer can grow crops and keep mixed stock, 3213, 3241–3. There are several plantations, amounting to about 2,000 acres, going up to 1,000 feet, 3218–24. The State should plant in blocks of not less than 300 acres, 3225–6, 3232. It would pay to buy up these high altitudes, 3230–1. The Government would have to buy up the sheep rights, 3227–9. Large areas are available for planting in Wales, 3225–6, 3233, 3237–40. The young men working in the State forests should receive wages, 3233. Sheep farmers would be glad of shelter planta-

tions, 3241–3. Land over 1,300 feet should not be planted, 3250–3. Species which stand against wind were planted on the outsides of plantations, and mixed conifers inside, 3258–60. Witness would not mix the varieties, 3260–2. Many foresters have left their calling because the pay is not high enough, 3201, 3263–8. Foresters have not much knowledge, and there is great need for education, 3266–8. The timber on Lord Penrhyn's estate was sold per lineal yard or per cubic foot, 3269–71. Larch fetched about 1s., 3272–3. Copse woods should be converted into high forest, 3274–80. Witness has had experience of planting bog land in Ireland on the shores of Lough Neagh, 3286–9. These bogs were formerly only used for snipe shooting and cutting turf for fuel, 3290, 3293; the depth goes down to 16 feet, 3291, 3297, 3302–4. It was planted with a general mixture of conifers, 3292. The land was drained, 3294–8. The trees reached an average height of 37–38 feet in 32 years, 3299. The trees succeeded well, 3290, 3300–1. English timber merchants do not care to purchase in Ireland unless they can get a regular supply, 3306. There is no demand for such bog land, 3307–12.

WEISSWASSER, school at.—App. II. (v.).

WOBURN.—Schlich, 2274, 2277; Ward, 3525–6.

WOODLANDS: (*a*) *Area.*—Craigie, 2904–8, 2929–32, 2945–66; App. XIV., XXI.

(*b*) *Condition and management of British.*—Margerison, 57–64; Bailey, 335, 379, 477–85; Selborne, 508; Slater, 747–9; Havelock, 1023–37; Forbes, 1231–4, 1289, 1372–7; Glanusk, 1401, 1417–21; Robertson, 1615–6, 1634–7, 1654–60, 1700–5, 1749–80; Davidson, 1907–11, 1922–9, 2043–8; Vernon, 2135–41, 2198–9; Schlich, 2370–6; Drummond, 2540–8, 2590; Pitcaithley, 2640–3, 2672, 2691–7, 2706–14; Croxford, 2781; Somerville, 3025–37; Michie, 3315, 3322–4; App. I. II., (viii.) (ix.), XI.

WOODMEN, see *Foresters.*

WOOD-PULP.—Bailey, 443–4; App. II. (xi.) (xiii.).

WOODS AND FORESTS, Office of, see *Crown woods.*

WORKING-PLANS.—Margerison, 15–17; Bailey, 335, 2782–6, 2808–27; Selborne, 508–10, 525–30, 568–76; Slater, 872–3; Havelock, 1032–3, 1117–8; Forbes, 1214–7; Robertson, 1714–7; Schlich, 2274, 2293; Pitcaithley, 2695–6, 2725–6; App. I., III., XXV., XXVIII.

WURTEMBERG.—App. XXVI., XXVII.

WYCOMBE chair industry.—Vernon, 2113–22, 2153–8, 2206–10.

YALE University.—App. XXIX.

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